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AND

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THE EMERYVILLE SHELLMOUND

BY

MAX UHLE

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AMERICAN ARCHAEOLOGY AND ETHNOLOGY

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THE EMERYVILLE SHELLMOUND.

BY

MAX UHLE.

CONTENTS.

Introduction.

California has but few characteristic archaeological remains such as are found in the mounds of the Mississippi valley or the ancient pueblos and cliff-dweller ruins of the South. In the shellmounds along this section of the Pacific coast it possesses, however, valuable relics of very ancient date. These are almost the only witnesses of a primitive stage of culture which once obtained among the early inhabitants of this region.

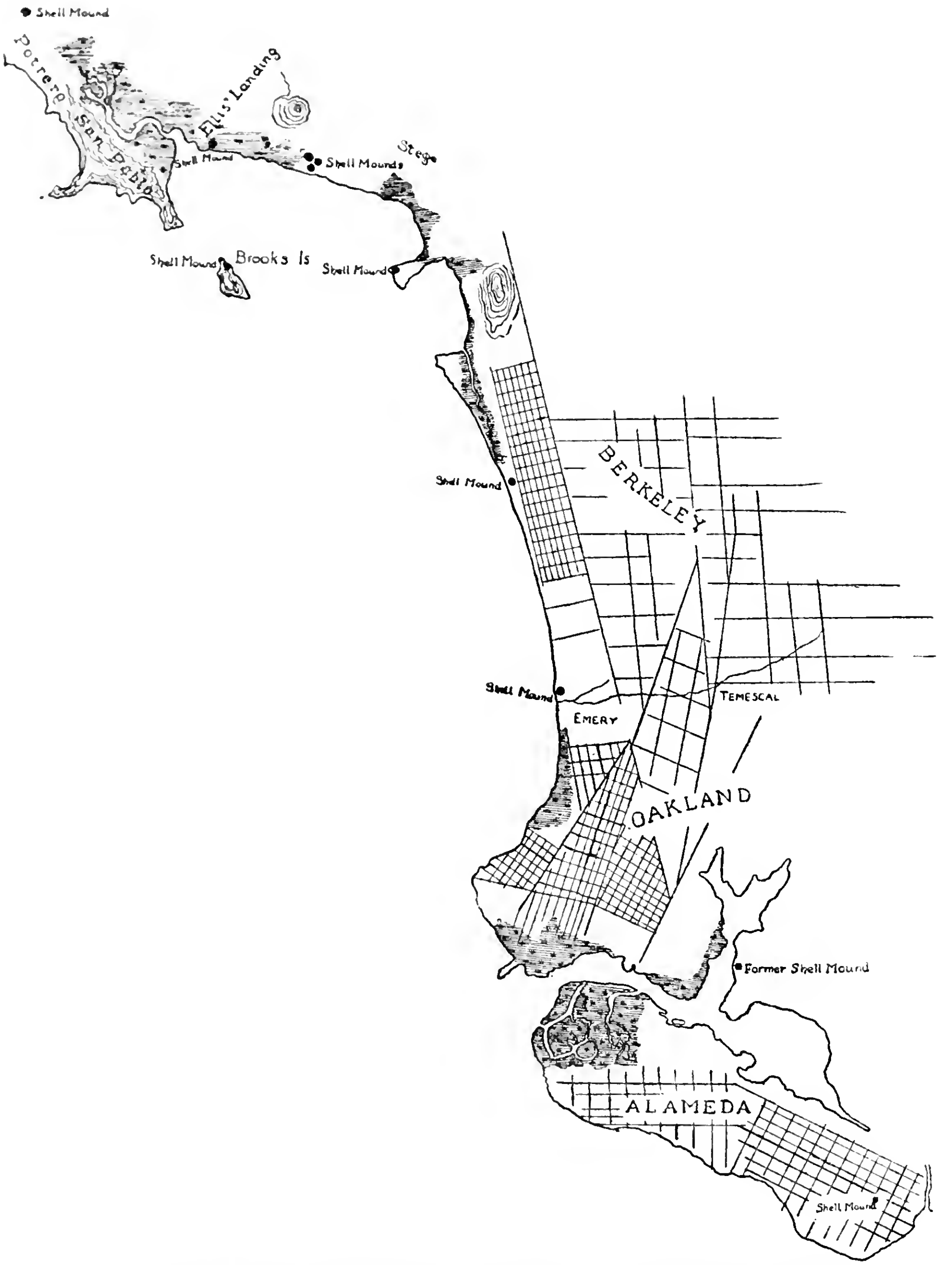
Some years ago Professor Merriam recognized the necessity of exploring these ancient mounds and represented the facts to the University of California. Mrs. Phoebe A. Hearst generously made the undertaking possible by providing ample financial support for the exploration work.

One of the largest and best preserved shellmounds was selected

as the object of the present investigation, which was entrusted to Professor Merriam and the writer. The mound selected is situated on the eastern side of the Bay of San Francisco at Shellmound Station near Emeryville, and is commonly known as the Emeryville mound. At present it forms a conspicuous feature of the recreation grounds known as Shellmound Park (pl. 1).

The water of the bay rises to within 130 feet of the base of the mound (pl. 3) during high tide. The beach is then only one foot above the water level, while the ground in the immediate vicinity of the mound is from two to three feet higher. This ground is quite level and forms a part of an extensive alluvial flat. A small creek, having its source about three miles away, in the hills back of Berkeley, passes the mound on its south side, at a distance of two hundred feet, and empties into the bay. In summer the creek runs dry, but its bed furnishes a channel for subterranean water. Another, lower mound, containing graves, lay on the site of the Emeryville race-track near by, but it has been leveled down during the construction of the track. The shellmound which was the object of the excavation has the form of a truncated cone, with a diameter of 270 feet at its base and 145 feet at the top, and rising 27 feet above the plain. On the north side its foot extends 100 feet farther over the flat, a few feet higher than the level of the ground about it.

Twenty-five or thirty years ago the shore line of the bay lay fifty feet farther out; a pile set at that time is still to be seen at that distance from the beach. It is above the water during high tide and marks the coast line on this side of which floodland was sold by the State. The top of the mound was not at that time crowned by the wooden pavilion which is there at the present time. It was still ungraded, having its natural conical form, and was covered with a wild growth of bushes and brambles. The creek, as yet unregulated, followed its own course and overflowed the land, causing it to become marshy. In the seventies and eighties of the last century, railroad tracks were laid along the eastern side of the mound, and took in a section of its eastern foot. At that time a number of graves and Indian artifacts were discovered. Few of these, however, found their way into the collections of the University, then but recently founded.



Map of the east shore of San Francisco Bay in the vicinity of Berkeley, showing the location of the Emeryville Shellmound with several others in this region. Scale: 1 inch = about three miles.

Early Settlements in the Region.

Fages, the first traveler who passed through the country, from south to north, traveled along the eastern shore of the Bay of San Francisco in 1774,[1] and came upon Indian settlements where he found a friendly welcome. His account of this expedition, however, fails to throw any light upon the question whether or not the shellmounds were still occupied at that time. The neighboring creek bears the name of "Temescal" from a region between Berkeley and Oakland through which it passes.[2] This name appears to be a mutilation of the Nahua word "temazcalli," hothouse, the name of sweat-houses in Mexico, and the place may have been so named by Mexicans living on the Bay, from an Indian sweat-house standing there. Hence it may be assumed that an Indian settlement was in existence on the banks of this creek at a time from which the name could pass over into the existing vocabulary.

Other evidences of early Indian settlements in this section of the eastern shore country of the Bay are the shellmounds, twelve of which may be found along the coast between Point Richmond and Alameda in a stretch of twelve miles (pl. 1). They may be seen near Point Richmond upon the eastern side, facing the peninsula, upon Brooks Island, near Ellis Landing, northeast from Stege upon a marshy ground intersected by narrow channels, near Seaver's Ranch to the west from Stege, on Point Isabel, in West Berkeley, in Emeryville, and in the eastern section of Alameda between Mound, Central, and Lincoln avenues. There is also said to have been one in East Oakland on the canal between Oakland Harbor and Lake Merritt, but it has disappeared owing to building over that section of ground. In all probability many others may have met with a similar fate.

All these evidences of an early occupation of the country are but a few of the mounds that skirt the Bay upon all sides, continuing along Suisun Bay and the Sacramento and Feather rivers. Besides these, there are numerous mounds dotting the coast land

[1] Cf. H. H. Bancroft, The Native Races, 1886, II, p. 595.

[2] Cf. also "San Francisco Quadrangle" with the topographical maps of California by the U. S. Geological Survey.

of Northern California, those surrounding swamps and rivers along the Tulare and Kern lakes in southern California,[3] and on the shore near Santa Cruz. Others are found in the regions of San Luis Obispo,[4] of Santa Barbara,[5] and the islands opposite that place.

Early References to Shellmounds of Middle California.

All the publications treating of the shellmounds of central and northern California, which from the nature of their contents are different from those of the coast and the islands of southern California, may be condensed into the following bibliography:

The Smithsonian Reports of 1869 mention a collection of artifacts from the shellmounds of Alameda county presented to the Institute by Dr. Yates.[6] J. W. Foster, in 1874, speaks of a newspaper notice concerning a shellmound in the region of San Pablo.[7] James Deans follows in 1876 with a short notice (together with drawings of some artifacts) concerning a mound between Visitacion Valley and Point Bruno on the western shore of the Bay.[8] A short notice by H. H. Bancroft, accompanied by views of four objects, points to the great historical value of the shellmounds.

[3] Warren K. Moorehead, Prehistoric Implements, 1900, p. 258.

[4] Paul Schumacher, Smithson. Reports, 1874, p. 335 ff.

[5] Schumacher, Bulletin of the U. S. Geol. and Geogr. Survey of the Territories (F. V. Hayden), 1877, III, p. 73 ff.; F. W. Putnam, Reports upon Archaeological and Ethnological Collections from vicinity of Santa Barbara, Cal., etc.; Report upon U. S. Geogr. Surveys west of the 100th Meridian (G. M. Wheeler), 1879, VII, Archaeology. From more northern sections of the Pacific Coast may be mentioned specifically the shellmounds of Oregon (P. Schumacher, Bulletin, *l. c.*), of Vancouver, and of the mainland of British Columbia opposite (H. H. Bancroft, Native Races of the Pacific States, 1886, IV, p. 739), also those upon the Aleutian Islands, explored exhaustively by W. H. Dall (in U. S. Geogr. and Geol. Survey of the Rocky Mountain Region, J. W. Powell, Contributions to the North American Ethnology, 1877, I, p. 41 ff.). Together with those of California these shellmounds are an important counterpart to those found along the Atlantic coast, found from Nova Scotia to the Gulf of Mexico, as well as in the river valleys of nearly all the southern states (Charles C. Abbott, Primitive Industry, 1881, p. 439; Short, The North Americans of Antiquity, 1892, p. 106), and almost all of which have been carefully studied in some of their aspects, although not yet conclusively.

[6] Smithson. Reports, 1869, p. 36.

[7] Prehistoric races of the United States of America, 1874, p. 163.

[8] Journal of the Anthropological Inst. of Great Britain and Ireland, 1876, V, p. 489. The majority of these shellmounds have been graded down.

The Marquis de Nadaillac in his well known work mentions the shellmounds in the vicinity of San Francisco.[9] Moorehead in his work gives a few remarks on excavations in shellmounds of central California.

The Nature of the Excavations.

The work of exploration was commenced by Professor Merriam and the writer in February, 1902, toward the end of the rainy season, and was finished early in May. Captain Siebe, the proprietor of Shellmound Park, gave all possible assistance in the investigation. Owing to the presence of the circle of trees around the truncated top of the mound it was necessary to confine the excavations to a lateral section and a tunnel extending from it toward the center of the mound. However desirable a more extended section through the hill might have been, the results obtained in these partial excavations are as a whole similar to those which would have been obtained by a cut through the entire mound.

The western slope of the mound, facing the bay, was selected as the starting point for the operations. The entire work of excavation may in a chronological order be divided into the following four stages.

A. The first lateral cutting in the mound. This was made in the western foot of the mound, seven feet and a half above the level of the bay and at a distance of fifty feet from the plateau. The trench was two feet deep, eighteen feet long and six feet wide, its floor sloped towards the center of the mound.

B. Tunnel construction. The tunnel formed the underground continuation of the trench; it was the means of reaching the interior of the mound and down to its original base. Hence the floor of the tunnel was made to slope steeply inward. The tunnel was extended from the end of the trench *A* for forty-two feet into the interior of the mound, and at its terminal point it sank to two feet below the level of the bay. It was five feet wide and six and a half feet high. Several distinct strata were cut through by the tunnel section. Eleven feet of the length of the tunnel extended under the plateau of the mound. This was still

[9] Prehistoric America, ed. by W. H. Dall, 1885, p. 50.

sixty feet from the vertical center of the hill (pl. 4). but the observations made in this interior part of the mound were of a relatively greater value than those of the outer zone. Many difficulties were met during the construction of the tunnel, among which the porosity of the soil was one of the worst. The tunnel was therefore timbered and its sides sheathed. Another difficulty was the ground water, of which there was often a very strong flow when digging in the lower part of the tunnel. According to the advance of the season, it was encountered at different depths, and it grew less with the approach of summer. A small hand pump was used to exhaust this water, but it barely answered the purpose, and it was often with great difficulty that the inrushing water could be mastered.

C. The upper vertical cut of the entire mound. In order to obtain a view of all the strata contained in the mound this section was undertaken. The lowest parts of the mound having been thoroughly explored by the construction of the tunnel, it was now sufficient to make the upper sectional cut only as deep as the roof of the tunnel, while its terminal point was fixed by the circle of trees on the summit of the mound. Its greatest length from the mouth of the tunnel was twenty-six feet. The sides of the cut were sloped in order to prevent the fall of loose soil and to avoid the cost of timbering. The length of this section at its lower end, near *b* (pl. 4), was reduced from 26 feet to 19 feet, and the width to 10 feet along the entire foot of the trench from *a*[9a] to *b*. In pl. 5 there is shown the first cut into the mound, before it had been made wider by five feet throughout its length. In making this cut the earth was removed stratum by stratum. For want of other marks of division, the dividing lines of the various strata (I to VII) were chosen arbitrarily from the several visible lines of structure, and they are marked in the diagram, pl. 4, by asterisks. In order to obtain a uniform classification of the contents of the mound it was thought necessary to introduce the same lines of division in the sectional diagram of the tunnel; objects found there had been marked previously by the distance of their position from the mouth of the tunnel and their relative height.

[9a] *a* seems to have been situated at the intersection of the dotted lines separating divisions *A*, *B*, *C*, pl. 4, fig. 2.—Editor.

These strata in conformity with the numbering of the upper ones were marked as numbers VII to X.

D. A series of pits was dug from the foot of the tunnel out to the bay shore. The pits were made in order to ascertain the general outline of the base of the mound under the cuts already made, as well as under the unexcavated portion of the mound farther out toward its margin. The pits are marked as *h* in the interior of the mound, and as *i, k, l, m,* toward its periphery. The two pits *n* and *o*[9b] are situated on the outside of the superficial foot of the mound, at a distance of 35 feet and 67 feet from the nearest pit, *m*. It was here seen that the terminal point of the foot of the mound lay between the pits *n* and *o,* the pit near *n* showing only the debris of the shellmound, while that near *o* revealed nothing of it. These two pits were connected by a trench, which gave an exceedingly interesting section of the margin of the mound.

The Base of the Mound.

The mound consists mainly of a mass of broken or entire shells, ashes, bits of charcoal, and some artifacts. This mass extends far above the surface of the surrounding land and ends two and a half feet below the level of the ground water and two feet below the general tide level of the bay, and rests immediately upon a sharply defined yellowish alluvial clay stratum. There is no indication of a rocky elevation which might have served as an inducement for the original settlement, and would have helped to raise the mound to its present height. Some of the charcoal and small boulders brought here by man rest upon the clay soil. A slight discoloration of the upper line of the clay stratum may have been caused by a transitory plant growth during some early period, while there is no indication of a crust of good soil which would be a sign of a longer period of vegetable growth upon it.

The base of the mound is horizontal according to all indications gained between pits *h* and *m*. A slight variation of the level of the ground near *h* of but a few inches does not materially change this level. Between *m* and *n,* however, the original

[9b] Pit *o* referred to in the text seems to be represented in pl. 4, fig. 1, by the west end of the cut extending from *n* to *l*.—Editor.

soil lies one foot and seven inches lower for a distance of thirty-five feet, and from *n* to *o* the level drops a foot lower. The mound was originally founded upon a site rising two feet above the adjacent ground on its western side. A gravel stratum of 8 inches in thickness near *o,* and of 4 inches near *p,* but disappearing towards *n,* covered the clay which originally sloped to the west. This gravel stratum was examined by Professor Lawson and considered to be probably a fresh-water deposit and not a deposit formed in the bay, as the gravel is more or less angular instead of much water-worn. The mound terminates near *p,* 177 feet from its center, where it runs to a point between layers of clay, which are above and below it (pl. 4, fig. 1). It rises again toward the outside for the last 17 feet measured from the depression *n,* the difference being one and one-quarter feet, thus varying from the rest of the base which inclines to the west. A stratum of ferruginous clay, the same as that underlying the base of the mound, is here inserted between the gravel stratum and the characteristic mixture of which the mound is composed, and covers it up even with the present surface of the soil. This raises the actual height of the shellmound from 27 feet to 32 feet and the actual diameter to at least 310 feet instead of 270 feet. The volume of the mound, measured as a truncated cone, may be estimated as being 55,000 cubic yards, or about 39,000 cubic meters.[10]

[10] The shellmounds in the vicinity of the bay differ considerably in shape and size. The majority appear as extended plateaus 10 to 12 feet in height, others appear as slight undulations of the ground about five feet in height. The truncated conical form is found more rarely; the mound at Ellis Landing near Point Richmond approaches it somewhat in its proportions. Many of these mounds cover acres of ground, *e.g.,* the mounds of Alameda, of Sausalito, of Sierra Point, of West Berkeley (in its older form, now much changed). In tropical regions many shellmounds are said to reach a height of 100 feet or more; this is known with certainty of some in Brazil (cf. Nadaillac, *l. c.,* p. 54), and also of two near the dried-up mouth of the Ica river in Peru. Shellmounds as a rule are much smaller. On the Atlantic coast near Smyrna a shellmound is said to be thirty feet high (Short, *l. c.,* p. 107), but the majority of these mounds are less than four feet high (cf. Wyman, Amer. Naturalist, 1868, I, p. 56 ff., and Abbott, *l. c.,* p. 440), while many of them extend over areas of more than two or three acres. A shellmound near the mouth of the Altamaha river in Florida is estimated as having a size of over 80,000 cubic yards (Smithson. Rep., 1866, p. 358). The shellmounds of Denmark are only from 3 feet to 10 feet high, although more than a thousand feet long (Ranke, Der Mensch, II. p. 552). Southern California shellmounds generally are from 4 feet to 5 feet high (P. Schumacher, Bull., *l. c.,* p. 38; and Smithson. Rep., 1874 ,p. 337, etc.). The same is the case with those mounds on the Aleutian Islands explored by W. J. Dall. In Oregon there are some of at least 8 feet in height (cf. Schumacher, *l. c.,* p. 29).

From what we know of the situation it is obvious that the mound was founded upon firm though still somewhat marshy land, near the bay shore and close to the creek. The latter was the occasion of its location[11] at this place. The ground must have been dry, since a gently rising slope was selected. The soil was alluvial and relatively new, since it has no overlying cover of good earth, yet it must have been dry long enough to allow a thin growth of vegetation to cover it, causing the slight gray discoloration of this stratum.

The situation of the base of the mound two feet below the water level cannot be explained on the assumption that refuse from a pile dwelling had been the first cause of its formation. This theory would presuppose modes of living to be followed by the Indians of this coast for which there is no parallel elsewhere, and which are not borne out by other evidence obtained in the study of the mound. If the mound has not risen from the water, then the former land surface must have sunk. The mound could not possibly have sunk below the water level from its own weight, for the original ground underneath it is still several feet higher than that to the west, for instance, near *n*, and sections of the base upon which the full weight of the mound rested, such as near *h*, are on the same level with others over which the mound rose only 14 feet. Since the sinking of the mound has not been brought about by local causes, it must have been caused by a general subsidence of this coast region. Similar subsidences of the coast, due probably to sliding motions, are frequent phenomena on alluvial coasts.[12] Evidences of this are furnished apparently by the

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[11] Shellmounds in the bay region are mostly in localities where there is fresh water, a creek or a spring, generally the former. W. H. Dall (Contributions, p. 34) observes that for the formation of shellmounds on the Aleutian Islands two conditions are necessary, as a rule: running water or a spring, and a site suitable for boat landing; one or the other of these conditions lacking, no shellmounds are to be found. In Oregon the shellmounds are generally to be found near a creek (cf. Schumacher, *l. c.*, p. 28). The same rule probably governs the shellmounds of the East. D. G. Brinton found shellmounds in Florida generally near running water (Smithson. Rep., 1866, p. 356), but he supposes as the cause of this the greater abundance of shells near the mouths of rivers, while it is certain that the presence of drinking water was the main attraction.

[12] Parts of the eastern coast of the United States are sinking. Several shellmounds on the Jersey coast are being washed away at present (cf. Abbott, *l. c.*, p. 448 ff.). The same may be observed with the shellmounds near Ellis Landing on the Bay of San Francisco.

shores of San Francisco Bay.[13] The ground under the mound having a slope of two feet, it may be assumed that the original foundation of the base was at least one foot above tide level. Accordingly the coast must have sunk three feet since the formation of this mound.[14] This sinkage was leveled up again to its former height by later alluvial deposits, in consequence of which the originally dry base of the mound is now situated two feet below the level of the bay, while the surrounding flats are three feet above it.

It is to be noted that the younger alluvial deposit, near *o* (pl. 4) has a thickness of six feet.

Samples of soil taken from various parts of the clay stratum underlying the base of the mound were subjected by Professor W. A. Setchell to microscopical examinations, but no Diatoms were found in any of them. Hence those strata were probably formed of alluvial deposits of the creek, as Professor Lawson had at first suggested, and not of deposits of the bay. This finding is entirely in accordance with the origin of the gravel stratum as above stated.

The slope of the mound was an obstacle to the course of the creek when it became swollen. In the natural course of things it deposited a bar near the foot of the mound, which, when the edge of the latter gradually extended, grew out over this new obstacle. The creek in the same manner continued to heap up alluvial deposits against the latter. The horizontal growth of the mound and the vertical growth of the surrounding land took place simultaneously. This was the cause of the brim-like upward curve of the edge of the mound as seen in the cross section (pl. 4). While the mound increased about seventeen feet in its periphery, the vertical alluvial accumulation was about one and one-half feet. Hence the base of the mound peripherally increased one foot while the ground grew one inch, showing that the alluvial growth of the soil was much slower than the peripheral growth of the

[13] Near the mouth of the valley of San Rafael a small hill rises from the bay, the isolation of which from the mainland may be explained in this way.

[14] Between the shellmounds of Emeryville and West Berkeley the shore for a long stretch forms a steep bank up to twelve feet high, and broken down by the water of the bay. Possibly the coast at this point formed a promontory on the two sides of which these shellmounds were originally founded, as in sheltered bays, similar to other mounds of this region.

mound. About 310 cubic yards or 240 cubic meters produce a growth of one foot in a mound 9 feet high and about 300 feet in diameter at the base. If the peripheral growth of the mound had continued with the growth of the soil, the foot of the mound would have spread out so that the outer edge would rest in the highest or surface layer of the present alluvium. The wedge-like margin situated between alluvial strata is, however, proof that its peripheral growth ceased a long time before the termination of the alluvial accumulation in this region, as a result of which the alluvium has spread itself over the foot of the mound. The alluvial deposit above the wedged-in margin of the mound (at *p*) being 3 feet 8 inches in thickness, and the alluvium deposited underneath it from the beginning of the formation of the mound measuring only 1½ feet, and assuming the increase to have been absolutely uniform, a period two and a half times as long has passed since the ceasing of its peripheral growth, as had been necessary for a peripheral growth of 17 feet on each side. The cessation of this peripheral growth of the mound, however, is not identical with the cessation of its growth altogether. It took place apparently when the mound began to grow more acutely conical in shape, whereby it increased to twice its former volume. Assuming that the mound was abandoned 100 years before the end of the alluvial growth of the land in the vicinity, then according to formula

$$100 \times \tfrac{2}{3} f = 2\tfrac{1}{2} \times \tfrac{1}{3} f$$

it might be concluded that the mound was probably 600 years old before it was abandoned.[15] Several numerical values upon which the formula is based are unfortunately so uncertain that the result may not be considered as more than suggestive of the possible age.

The sinking of the coast and the alluvial increase of the ground since the first settlement of the mussel-eaters would in themselves give an adequate measure for an estimate of the age of the mound if the measures upon which both depend were not also unknown; according to Professor Lawson, this probably occu-

[15] In that case the sinkage would have amounted to about 6 inches, the alluvial increase to about 9 to 10 inches in a century.

pied centuries at least.[16] At any rate, such observations as have been made furnish good reasons for believing that the founding of a settlement and the beginning of the heaping up of the mound occurred at a remote date.

The Internal Structure of the Mound.

The principal constituents of the mound are the shells. These have nearly all crumbled into small fragments and are slightly mixed with soil, which when damp gives the entire mass the appearance of pure soil. When this is flooded with water the washing away of the sand produces no noticeable change in its volume. This mass has mingled with it bits of charcoal, bones of animals, ashes or cinders, and stones averaging about the size of one's fist and blackened by fire.[17] Marks of stratification may be traced through almost the entire mound. Plate 5, representing a photographic view of the excavation, shows the stratification planes in the walls quite distinctly. The strata consist of compact masses of more or less fragmentary shells, or of beds of ashes or cinders. In many cases the latter seem to extend through the entire mound. They are sometimes not thicker than a sheet of heavy paper, but show the general direction of the bedding planes, and form a clear contrast with the homogeneous, dark mass of broken shells.[18] These planes become somewhat less distinct in the deeper strata.[19] As in other shellmounds,[20] there were observed certain rounded masses of shells intersecting the lines of stratification. These are

[16] The rapidity of the sinkage of alluvial coasts varies greatly owing to local conditions. For the Atlantic Coast the rate of sinkage is 2 feet per century (cf. Abbott, *l. c.*, p. 449). Applying this same rate to the eastern coast of the Bay, we would arrive at the absurd result that the shellmound of Emeryville had begun to form in 1750, while that date was presumably the end of its occupied state.

[17] The descriptions of nearly all the shellmounds explored in other parts of the world tally exactly with this one; cf. Ranke, *l. c.*, II, p. 532, for the Danish Kjökkenmöddinger; Schumacher, on the general similarity of shellmounds of the Pacific Coast with the mounds in Denmark, Smithson. Rep., 1874, p. 355, etc.

[18] Although no shellmound is free from stratification marks, owing to the gradual growth of the strata, Brinton maintains that this is the case with shellmounds on the Atlantic Coast (Smithson. Rep., 1866, p. 356).

[19] Compare the interesting observations of Wyman (Amer. Naturalist, I, p. 571) concerning shellmounds of New England, that there the shells of the lowest stratum were softer and more crumbled than those of the upper strata.

[20] Cf. Wyman, *l. c.*, p. 365, on a shellmound in the vicinity of Portland, Me.

caused by holes, made by moles or other burrowing animals, being afterward refilled with shells.[21]

In some shellmounds in other regions strata of earth and sand were found between the shell layers. These give evidence of a temporary evacuation of the shellmound. No evidence of this character was obtained in the study of the Emeryville mound, where the only occurrenee of a natural vegetable soil is the surface cover of 1 to 2 inehes in thickness, which has formed since the mound was finally abandoned.[22] It is possible that slight differences in the state of preservation of the shell deposits which now mark the strata lines may have been caused by differences in the length of time of occupation. Other explanations might, however, be offered.

The lines of stratification mark clearly the gradual development of the strata of the mound from the base until the present truncated cone was formed. It is apparent that two different principles governed the growth of the mound. At certain periods it tended to take on a shallow plateau form. At other times a conical shape developed without the corresponding increase around the base. According to the first principle the mound grew in the form of a plateau to a height of from 9 to 10 feet. Near *C* in pl. 4 the edge of the plateau still seems to be traceable, from which point the strata inelined downward. At that period the mound resembled in its proportions the old Indian camping places of the interior valley, some of which are still occupied; or some of the shellmounds along the Bay which have been abandoned at some earlier period. The undulating lines of the strata, such as seen near *f* and *g*, suggest irregularities of the old plateau surface, similar to those which may be observed in the surfaces of camp locations of the interior, which have been abandoned for decades. The hollows from 20 to 40 feet in length

[21] Similar holes made by moles may be observed occasionally upon old shellmounds along the Bay, which if they had been refilled with shells might also have assumed a rounded form. In such a manner may be explained the finding of a modern steel knife, with the wooden parts still well preserved, in one of the strata of the shellmound of West Berkeley in a plaee to all appearances undisturbed.

[22] Cf. also Wyman, *l. c.*, p. 571. The absence of true soil from the interior of the mound is proof that at no time was the mound abandoned by its occupants long enough to allow of the formation of sueh a stratum.

mark the sites of former sweat-houses or council-halls; these curves, such as that from *f* to *g*, may have a similar origin.[23]

The manner in which the mound was occupied for habitation varied in the upper strata. With the growth of the mound the diameter of the plateau decreased instead of expanding. From line *b* upward the strata incline obliquely toward the sides. This change in the manner of forming the mound signifies a change in the character of its occupants. It would be interesting to determine, if possible, the exact line where these two types of growth have met. It might have been about 12 feet above the base, so that the mound grew in the shape of a shallow plateau as far as the middle of stratum V in pl. 4, and that it changed after this period to its conical form.

Constituents of the Mound.

Shells.—The shell layers of the mound are composed principally of the following species:

Oysters, *Ostrea lurida.*
Mussel shells, *Mytilus edulis* and *Mytilus californianus.*
Clams, *Macoma edulis* and *Macoma nasuta.*

Many other kinds of shells, including the following species, were found scattered through the mound:

Purpura crispata and *canaliculata.*
Cerithidea californica.
Helix, two species indet.
Cardium corbis.
Standella, sp.
Tapes staminea.

Of these last species, the cockle, *Cardium corbis*, and the clam, *Tapes staminea*, occur quite frequently.[24] All of these were used as food by the occupants of the mound. The various species of *Helix* were probably also used, as they were in more recent times eaten by the California Indians.[25] It may be, however, that this species lived on the mound.

[23] Somewhat smaller but quite similar hollows are still preserved upon the surface of the shellmound of Ellis Landing, and are doubtless sites of houses of that nature.

[24] Eight-tenths of all the shells found in the Oregon shellmounds belong to the species of *Mytilus californianus*, *Tapes staminea*, *Cardium nuttalii*, and *Purpura lactuca* (Schumacher, Smithson. Rep., 1874, p. 335).

[25] As by the Minooks and the Nishinams (Powers, *l. c.*, pp. 348 and 430); and certainly the custom was a very general one.

The state of preservation of the shells is proportional to their natural hardness. Hence the shells of the Macomas are the most conspicuous, those of the mussels, as the most perishable, are the least noticeable ones in the mound. The relative frequency of occurrence in the case of the three most important species depends on different circumstances.

The lower and the upper strata of this mound are composed of the same varieties of shells, in which point it is different from many shellmounds in other regions. It is, however, true that oyster shells predominate in the lower strata, while *Macoma* shells are more numerous in the upper ones.[26]

Visiting the different shellmounds in the vicinity of the Bay, one finds a general similarity in the kinds of shells composing them. Rarely one or another variety of shell, the *Macoma* or the cockle, or some other, is found to predominate. This general homogeneity of composition in the shellmounds around the Bay, and the small differences in the amount of any particular species, indicates as a whole the general similarity of the shell fauna at many points about the Bay during the period of occupation of the mounds.

The Indian camping grounds in the interior, although quite similar in form and origin to the shellmounds on the coast, when opened generally present a great difference in appearance. Traces of shells are almost unnoticed from the outside, yet large quantities supplied as food by the rivers of the interior are doubtless to be found in them. These shells have been found during excavations, or their use has been confirmed by persons who observed the mode of living of the Indians of these regions. The Indians also obtained salt-water mussels by trade, even in quite recent times. From the fact that shells are not in evidence on the surface of the camp grounds, one must conclude that their use diminished.

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[26] We were not so fortunate as was W. H. Dall in the shellmounds of the Aleutian Islands in being able to make "a tolerably uniform division" of the layers in the mound according to the various foods used. (These layers were: "1, Echinus layer; 2, fishbone layer; 3, hunting layer." Contributions to North American Ethnology, I, p. 49.) The shellmound of Emeryville presents a much greater similarity in the kinds of food used during the different periods of its occupancy.

Bones.—Bones of vertebrates are also found in most of the shellmounds. These together with the shells represent the debris of their kitchens. No other shellmound has been seen where so large a quantity of bones was observed as in that at Emeryville. Bones of land and sea mammals, of birds, and of fishes were found in abundance throughout the mound, and fairly evenly distributed in the strata. This fact is the more remarkable since the shellmound at West Berkeley, scarcely two miles distant, does not yield nearly such quantities of bone as this one. The occupants of the mound at Emeryville at all periods were huntsmen to a great degree, besides being fishermen; those of the mound at West Berkeley seem to have depended largely upon fishing; hence the stone sinkers were far more numerous in that mound than at Emeryville.

So far the fauna of only the lowest strata up to 3 feet above the base have been studied. The following species obtained in this horizon were determined by Dr. W. J. Sinclair.

Deer, *Cervus* sp.
Elk, *Cervus canadensis.*
Sea-otter, *Enhydrus lutris.*
Beaver, *Castor canadensis.*[27]
Squirrel, *Spermophilus* sp.
Rabbit, *Lepus* sp.
Gopher, *Thomomys talpoides.*
Raccoon, *Procyon lotor.*
Wild cat, *Lynx* sp.
Wolf, *Canis* sp.
Bear, *Ursus* sp.
Dog, *Canis familiaris.*[28] (?)
Seal, *Phoca* sp.
Sea-lion.
Whale.
Porpoise?
Canvasback Duck, *Aythya vallisneria.*
Goose?
Cormorant, *Phlacocorax* sp.
Turtle.
Skates, Thornbacks, and other fish.

[27] Extinct in California, and in fact south of Washington; J. Wyman found the remains of elk, wild turkey, and large auk in the shellmounds of New England. The elk, though still in existence, is no longer to be found east of the Allegheny Mountains; the wild turkey is still in existence, but is not to be found in New England, while the auk lives only in the Arctic regions, or at least not farther south than the northern part of Newfoundland (Amer. Naturalist, 1, p. 572).

[28] Also found in the shellmounds of New England.

No traces of cannibalism have been detected. Most of the hollow bones of larger mammals, and even the smaller bones of the foot, were found to have been split to get at the marrow.[29]

Fireplaces.—These were generally known by beds several feet in length consisting of charcoal and yellowish ashes. They occurred in many spots throughout the mound. Numberless scattered bits of charcoal[30] and pebbles, mostly about the size of one's fist and blackened by fire, were further evidences of the continuous use of fire in the preparation of food. In no instance were there any stones set in rows for fireplaces, such as have been observed elsewhere, as in a shellmound near Sierra Point, where stones are plentiful.[31] A very peculiar feature of this mound is a yellowish layer of ashes comprising the entire depth of stratum II in pl. IV, and tapering towards the edge of the mound. Above it lies only the uppermost stratum (I), that of vegetable soil. Though calcined shells[32] occurred elsewhere in the mound, they were especially numerous in this ash stratum, and in some spots all shells were calcined. The origin of this ash stratum will be explained later. A similar bed is to be seen in a central layer of the shellmound at West Berkeley, and another one of similar thickness but shorter in a mound near Sausalito.

Human Remains and Relics.—A large part of the Emeryville mound consists of remains which have been deposited here by man. Among these are molluscan shells with bones of fish and mammals, used as articles of food. In the narrower sense the human relics consist of the bones of man, graves, and artifacts, which are all found in greater or less abundance throughout the whole thickness of the mound. Actual human bones were not found to be common in this part of the mound except in stratum II, and in the graves of stratum VII. The artifacts obtained

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[29] Cf. for shellmounds in Denmark: Ranke, *l. c.*, II, p. 532, for those of the Atlantic Coast, Wyman, *l. c.*, p. 575 (New England) and Abbott, *l. c.*, p. 442 (New York).

[30] Analogous is the statement of Wyman, *l. c.*, p. 564, about the shellmounds of New England.

[31] Cf. also Hellwald, Der vorgeschichtliche Mensch, p. 449, on the Kjökkenmöddinger of Denmark.

[32] Nadaillac, *l. c.*, p. 50, states from uncertain authority that a shellmound near San Pablo was said to consist of calcined shells exclusively, which is certainly an exaggeration.

were only those of very resistant material, such as stone or shell. All other kinds, such as textiles of plant fibre, baskets, and implements of wood, which doubtless have also existed, had disappeared. The more resistant artifacts were distributed throughout all layers of the mound.[33]

About 200 cubic meters of earth were removed and sifted during the excavations, and yielded 600 artifacts of various kinds, averaging three specimens to one cubic meter. The volume of the whole mound we computed to be about 39,000 cubic meters, and it may be assumed that by excavating the entire mound the yield would be about 100,000 specimens, which indicates that many generations must have lived here to deposit such a large number of objects of imperishable material alone.[34]

The same computation was applied to each separate layer in the mound, and it was shown that the yield differed according to the section and the stratum explored. The open cut *A* yielded one specimen to .75 cb. m., and the tunnel *B* and the pits *h* to *m*, six per cb. m. Section *C* yielded three artifacts to one cb. m. This computation shows that sections nearer the center of the mound yielded the greater number, those toward the edge a smaller number. It also appears that the lower strata contained a larger percentage of artifacts than the upper ones. If, however, the number of flaked chert fragments were subtracted from the yield of the lower strata, their percentage would be much the same as that of the higher layers. The following are the contents of the various strata:

Stratum I had 20 artifacts per 15½ cb. m. = 1.3 per cb. m.
Stratum II, 30 cb. m—133 objects = 4.4 per cb. m.

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[33] It is alleged that there are shellmounds in the East which contain no implements at all, and have been used for the gathering of mussels only, and not as dwelling places (Abbott, p. 447, accord. to Charles A. Woodley). Equally uncertain seems to be the distinction made by Schumacher between shellmounds yielding few artifacts and those containing a larger number, as representing a place for temporary or permanent habitation. Similarly dubious is that classification which considers the piling up of shells in various separate heaps as proof of permanent abode and that of single mounds for the use only as temporary stopping places (Smithson. Rep., 1874, pp. 337 to 338).

[34] W. J. Dall (contrib. *l. c.*, I, p. 47) states that during his excavations of the shellmounds of the Aleutian Islands he found on the average one object in one-half ton of earth. This would be 2.63 objects to one cb. m. The yield of the Emeryville shellmound is three objects to one cb. m.

Stratum III, 20⅔ cb. m.—27 objects = 1.16 per cb. m.
Stratum IV, 11¾ cb. m.—41 objects = 3.5 per cb. m.
Stratum V, 9⅔ cb. m.—34 objects = 3.5 per cb. m.
Stratum VI, 4⅕ cb. m.—9 objects = 2.1 per cb. m.
Stratum VII, 2⅘ cb. m.—10 objects = 3.5 per cb. m.

The specimens contained in the graves in strata VI and VII were not counted in with the rest. This comparison shows mainly that stratum II is the richest in implements. The connection of this fact with the preponderance of ashes will be pointed out later.

Burials.

Shellmounds originate on the accumulated refuse deposited by people who have lived in the place when the heap has formed, and the mounds may therefore be regarded as sites for dwelling places, or abodes for the living, and not as mounds set aside as burial grounds by people living elsewhere in the vicinity. Whenever these mounds were used for burials it was not done in spite of their being dwelling places, but rather because they were such.[35]

Many tribes of a low grade of civilization follow the custom of burying their dead underneath their feet in the ground upon which they live, to protect the graves of their dead against being disturbed and also to enjoy the protection of the spirits of the departed against their enemies. Wherever graves are found in shellmounds, in all parts of the world, their presence is generally to be explained in this way.[36]

Ten graves containing skeletons were found during the excavations. They were found only in the middle layers of the mound in a zone extending from stratum VI to stratum VIII. The two lowest layers and the five upper ones contained no evidence of interment, indicating that the custom of burial underneath the

[35] See P. Schumacher, Bull. *l. c.*, p. 38, for burials in the mounds on the Island of San Miguel.

[36] Virchow found them in the Spanish shellmounds (Ranke, *l. c.*, II, p. 533), while in those of Denmark they are absent. Schumacher (Smiths. Rep., 1874, p. 337) states that he observed shellmounds in Southern California which had been temporary abodes only and were devoid of graves; while D. G. Brinton asserts that in Florida graves occurred in natural shellmounds, while artificial shellmounds were free of them (*l. c.*, 1866, p. 357). Such general statements cannot be accepted unless they are supported by observations over larger fields than these.

dwelling places was observed in one period only. We have no evidence concerning the location of the burials previous to that period or subsequent to it. A burial site slightly elevated above the plain was unearthed some years ago under a shellmound near the principal mound in Emeryville, but as this probably dated from the same period as the graves in the shellmound no light is thrown upon the question.

In the upper strata of the mound there is, however, furnished evidence of a different manner of disposing of the dead, which was observed during the period of the deposition of strata II, III, and IV. During the period represented by strata VI to VIII the dead were buried in the ground. It has already been shown that stratum II consists mainly of ashes and calcined shells, which cannot be regarded as kitchen-midden deposit or as the remains of fireplaces, the latter forming an inconspicuous part of the stratum. Another characteristic feature of this layer is the high percentage of calcined bone implements found there. Very common among them are awls, of which stratum II contained 44 calcined specimens, or 72 per cent. of the whole number. In the other layers a much smaller number has been found, but the percentage of calcined specimens is high. The supposition that these were accidentally burned cannot be considered an adequate explanation, but the fact that a number of human bones were found at the same place in the strata gives weight to the theory that during the deposition of the upper beds the inhabitants of this region practiced cremation of their dead, a custom common among the California tribes of today. Then as now they were accustomed to burn all personal belongings with the body.[37] This accounts for the large number of calcined bone objects and shells in stratum II. Doubtless a large number of shell-fish were thrown into the fire as food for the departed on their long journey into the next world.

Doubtless the practice of cremation was not confined alone to the period of stratum II. The percentage of calcined awls in other strata than this suggests that the builders during the ac-

[37] H. C. Yarrow, Introduction to the mortuary customs among the North American Indians, 1880, p. 58, points out that this custom was general among those Indians who cremated their dead.

cumulation of stratum I, and probably also of III and IV and parts of V, practiced this custom, but to a less extent than in the period of stratum II, or mainly at other places than the mound.

Eight of the ten graves containing skeletons lay close together in the narrow space of the middle section of the excavation. Four were found in strata VI and VII of the upper cut *C*. Four of the graves were those of children, lying at different depths in the line of the tunnel. Two other graves were isolated from the others, lying in the edge of the mound. None of the burials were less than nine feet below the present surface. The lowest grave, No. 10 (pl. IV, fig. 2), was 21 feet below the surface. In accordance with the stratification lines of the mound, graves 1 and 2, as well as 6, 8, and 9, may be considered as belonging to the period of strata VII and VII*a*. The eight graves which lay close together in the middle of the main excavation were distributed over a space of about 90 square feet. The vertical distance from the uppermost to the lowest of these was nine feet. As the tunnel inclines toward the center of the mound it is not certain whether the cemetery extended through the entire mound or was only around the margin of a settlement on the summit of the mound at the time when it was in use. From the depths at which the different graves were found, varying about nine feet, it is clear that they were not constructed within a short period, but that long periods intervened, during which the mound grew very considerably through the deposition of refuse. P. Schumacher explored the graves of Oregon, which lay at a depth of from 1½ to 2½ feet below the surface, and probably the tribes of the Pacific Coast buried their dead in comparatively shallow graves.[38] In the case of a child's grave (No. 9, pl. 4, fig. 2) it was seen by the stratification lines that it was not made deeper than 1½ feet below the surface. Assuming this as being the general depth of the graves throughout the mound, then the graves varying between 2½ and 12½ feet above the base of the mound were dug at periods when the entire height of the mound was about 5 to 14 feet, hence the period of these burials would have to be placed

[38] Bulletin U. S. Geol. and Geogr. Survey, III, p. 34. In other places shellmound graves lie deeper; thus sometimes three to six feet on the Island of San Miguel (P. Schumacher, Bull. *l. c.*, p. 38).

entirely during the time of the earlier plateau-like growth of the mound. This period of burial is very closely followed by that of cremation, the two possibly overlapping.

The preparation of the graves was not elaborate. A simple pit sufficed. It was made large enough to place the body in it with the knees drawn up. The sides of the grave were left bare. If a covering existed originally it must have been of perishable materials, for none have been found in excavation. The bottom of the grave, however, was prepared somewhat like a bed. A layer of charcoal from one-half inch to one inch thick is found at the very bottom, above that another layer of like thickness of iron oxide. Upon this the body was laid on its side. It is evident that the body was buried with its clothing and personal ornaments, in exceptional cases with utensils or implements only. The body was tightly bound at the knees before burial. Owing to climatic conditions, causing excessive moisture in the strata, the greater part of the material buried with the corpse has decayed and disappeared. Five of the ten graves were entirely lacking in implements or other artifacts.

Before burial the body was entirely covered with the red earth mentioned above. This settled down upon the bones after decomposition and is still adhering to them in some cases like a thick crust. The hands were placed on the body in different ways. In several instances the left hand rested upon the knees, while the other was raised to the mouth or to the crown of the head. The corpse is usually laid upon the right side, generally facing northeast. Associated with a number of skeletons were a variety of interesting ornaments, including beads made from shells of *Olivella* and other mollusks and from sections of bird bones strung together. With skeleton No. 4 were associated a large number of perforated mica flakes. The flakes of mica may originally have been fastened to a garment which shrouded the dead, and when this decayed in the earth the flakes remained there about the body. Beads of bird bone were found in the mouth also, but their presence there might be explained by the settling of the skull in the earth. Mica was much used by the Indians for ornamentation. It has been observed in Peru in a number of cases in the vicinity of graves, but circumstances did not show whether

its presence there was purely accidental or not. In the mounds of the middle west of the United States there have sometimes been found ornaments of thin plates of mica of round or oval form, provided with holes to fasten them to the clothing.[39] Similar objects were found in West Virginia and elsewhere. Pieces of mica 2 or 3 inches in size are reported to have been found in mounds or in places suggestive of their use for religious purposes.[40] Beads like the above mentioned from California, both from graves and from living Indians, were pictured by Holmes.[41] With burial six was a bone ring set with shell beads fastened on with asphalt. In burial seven were numerous bone rings similarly decorated with shell beads. Also in burial seven was found a large quartz crystal. One end of the crystal is preserved unbroken. The other end is capped with asphaltum in which numerous small shell beads are set. Quartz crystals have been found elsewhere in California in graves.[42] The above mentioned crystal, however, reminds us most strongly of a number of crystals one foot in length and of the thickness of one's arm, found during the excavation of the western wall of the Temple of the Moon at Moche (Trujillo), in Peru, now in the collection of the University of California. These, too, had the coating of red coloring earth, the same as the object shown on pl. 11, fig. 9, and were found under peculiar conditions pointing strongly to their religious significance.

Several peculiar bone implements were obtained in burial eight.

The mode of burial seen here resembles that observed elsewhere in the shellmounds of California, for example, near San Luis Obispo, and that of other regions on the Pacific Coast (Oregon), and it is still followed among the California Indian tribes. The burial of the corpse with its knees drawn up has also been observed in Southern California[43] and Oregon.[44] From the latter

[39] Charles Rau, Ancient Aboriginal Trade in North America, Smithson. Rep., 1872, p. 361 (from G. Squier).

[40] *l. c.*, p. 360.

[41] Art in Shell, Second Annual Report of the Bureau of Ethnology, 1880 to 1881, pl. XXIII, fig. 6.

[42] P. Schumacher, Smithson. Rep., 1874, p. 349.

[43] Central California, cf. also Moorehead, *l. c.*, p. 259.

[44] P. Schumacher, Bull. *l. c.*, p. 34.

region also the varying positions in which the corpses face is confirmed by Schumacher.[45]

To the layer of charcoal and red iron oxide which generally formed the bed of the dead may be compared the "thick burned brick-like crusts" and the "thin light colored crusts" found by Schumacher in Southern California graves.[46] A large number of lumps of red coloring earth were found throughout the mound, some of these showing marks of scraping or cutting. In Southern California graves we find conditions resembling these almost identically.[47] Up to recent times the California Indians very generally painted their bodies, and there is undoubtedly a religious significance in this practice of daubing the corpses and associated objects with red coloring material, besides depositing them on red earth. The custom of putting red coloring matter on the body of the dead is found with many aboriginal tribes. So the Caribs in Jamaica[48] paint the entire body of the corpse. The Santees of South Carolina[49] painted face, neck, and hands of the corpse. The Dakotas[50] painted the face alone. In a number of Peruvian mummies the faces were painted red. Crania from ancient Peruvian graves that had been disturbed at some early time were also found covered with red paint.

The absence of implements is explained by Schumacher by the analogous custom of the lower Klamath tribes, where the implements are laid upon the grave instead of being buried with the dead.[51] This custom may have prevailed in this shellmound.

It was an unfortunate circumstance that the exploration in Emeryville occurred at a season of the year when the interior of the mound was still very damp from preceding rains. For this reason none of the skulls could be secured intact, and they will need to be carefully prepared before use can be made of them for

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[45] F. W. Putnam, Rep. upon U. S. Geogr. Surveys, *l. c.*, p. 30; Schumacher, Smithson. Rep., 1874, p. 341.

[46] Smithson. Rep., 1874, p. 342.

[47] Putnam, *l. c.*, p. 22; Schumacher, Smithson. Reports, 1874, p. 350.

[48] Yarrow, Introduction to the Study of Mortuary Customs among the North American Indians, 1880, p. 54.

[49] Schoolcraft, Archives of Aboriginal Knowledge, 1860, IV, p. 156.

[50] Yarrow, *l. c.*, p. 71.

[51] Bulletin *l. c.*, p. 34.

anthropological study. It may be noted that none of them show striking eccentricities of form.

Following is a detailed statement of the occurrence and the contents of each of the ten burials excavated.

No. 1, pl. IV, fig. 2, was found 9 feet below the present surface; it may be contemporaneous with the graves of stratum VII (as 6 and 9). The skeleton was that of an adult, drawn up in the usual manner. It was laid on its right side and was facing east. The left arm rested upon the knee, the right hand on the crown of the head, where also was found a cockleshell. The skeleton lay on a bed of red soil; the bones were slightly reddened. No associated objects.

No. 2. Skeleton of an adult, found at a depth of 9 feet in the outer part (*A*) of the excavation; neither red earth nor associated objects present. The burial dated probably from the same period as the preceding.

No. 3. Grave of a young person, about 15 years of age, in stratum VI. The skeleton was facing northwest. No artifacts or other associated objects.

N. 4. Grave of an adult, in stratum VI. The skeleton lay from east to west upon a double bed of charcoal and red earth. Interspersed in the soil were found a great quantity of flakes of mica 1 to 1¾ inches in diameter, rhomboidal, triangular, and irregular in shape, and each with a hole at one end (see pl. II, fig. 18); also a quantity of beads made of bird bones were found upon the cranium as if they had formed part of a net drawn over it; others lay along the sides of the head and along the temples.

No. 5. Skeleton of an adult lying from east to west and facing north. Stratum VI. The cranium shows a lupus-like mutilation of the nose (fig. 2). No ornaments.

No. 6. Grave of a child a little over a year old, found in the tunnel in stratum VII*a*, at a depth of 17 feet below the surface. It lay from north to south upon a bed of charcoal and red earth. Various ornaments and other articles were taken from this grave, all covered with red earth. A number of shell beads, both flat (cf. pl. 11, figs. 6*a* and 6*b*), and concave forms (pl. 11, figs. 5*a* and 5*b*) lay in rows from the neck down along the body, and were originally necklaces; two bored round pieces and two oblong ones

(pl. 11, figs. 1 and 2) of *Haliotis* shell had completed the necklace. An unusual object (pl. 11, fig. 8) found here was a flat ring three-eighths of an inch wide, three-sixteenths of an inch thick, neatly made of stone, both surfaces being decorated with a number of shell beads, originally 11 to 12 on each side, fastened with asphaltum. This object may have been a pendant, but doubtless it possessed talismanic virtues.

Shell beads like the larger convex ones of *Olivella* sp. have been pictured by Holmes as objects belonging to early and modern Indians of California. Possibly they also resemble the shell coin "Kolkol" of the modern Indians, which is made of *Olivella*

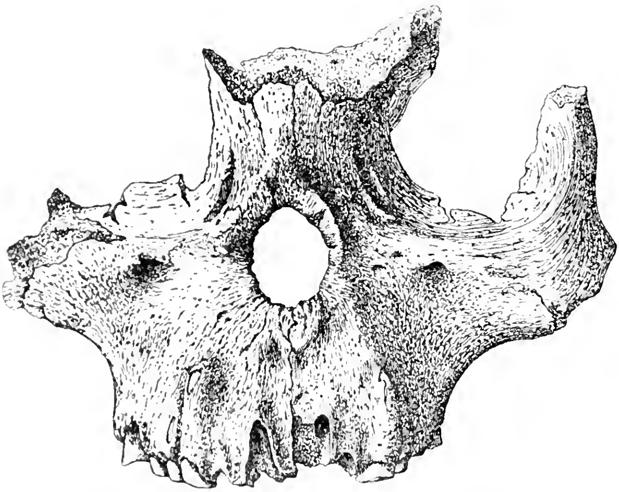

Fig. 2.* Skull showing lupus-like mutilation of the nose. × ½.

biplicata, according to Powers, and was strung in such a manner that the beads faced each other in pairs, but are not much in use in modern times.

A shell ring of similar proportions as above, but differing through its inferior material and the absence of decoration, has also been pictured by Holmes as coming from Illinois, and as being an ear ornament presumably, while the object described above could not have served that purpose.

* Fig. 1 has been omitted owing to double references in the manuscript.—Editor.

No. 7. Grave of a child about one year old, found in stratum VIII, about 21 feet below the surface of the mound. The body lay upon the usual bed of charcoal and of red earth and all the little bones were thickly covered with red coloring matter. The grave was as rich in artifacts as the preceding one. A number of small shell beads (as in pl. 11, fig. 6) were found near the wrist. The following objects were taken from the earth about the body:

Three oblong ornaments, bored, of *Haliotis* shell (pl. 11, fig. 1), a number of very small shells of *Olivella* sp. having bored ends, which fact shows that they were used as ornaments; 11 bead-like rings of bone, each being about one inch long and seven-sixteenths of an inch thick; each has a band of asphaltum in which three or four small shells were imbedded (pl. 11, figs. 10, 11). While these rings may have been mere ornaments, the following unusual object (pl. 11, fig. 9) taken from the same grave must without doubt have talismanic importance. It is a piece of quartz crystal $2^{15}/_{16}$ inches long and $1\frac{1}{2}$ inches thick, having perfect lateral edges and points; the broken base of the crystal is capped with asphaltum in which numerous small shell beads are set.

All these objects were thickly coated with red coloring matter. For the small ornamental *Olivella* shells compare similar ones from Santa Rosa Island, California, pictured by Holmes (l. c., fig. 7). The bone ring resembles the thick bead-like bone ring taken from another of the graves, stratum VII*a*, of the mound.

No. 8. Burial of an adult, in stratum VII, found above the tunnel. The body in the usual squatting position was placed from north to south, facing east, upon a bed of red earth and was itself colored red. This grave contained besides objects of personal adornment a number of bone implements. The former consisted of a number of beads made of bird bone (types similar to object pl. 11, figs. 15 to 17) and a like number of *Olivella* shells bored at the lower end (pl. 11, fig. 3); they were scattered in the earth about the body. One of the *Olivella* shells was perforated on its side (pl. 11, fig. 4). Several of the bone beads were connected in twos by thinner bones (pl. 11, fig. 15). It may be assumed that the bone beads and shells had been fastened to a garment that served as a shroud for the body but has now disappeared.

The bone implements taken from this grave have the shape of paper cutters; there are five in all, representing two distinct types. Three are made of a hard bone (pl. 8, fig. 4) and are imperfect at their upper ends; the form is that of a horn, the worn edges show their use as tools; the other two objects (pl. 8, fig. 5) are made of a much softer bone; they are unfinished at their lower ends. The two types are distinct, although it is difficult to compare them in their very imperfect condition. The upper end of the implement of the second type shows two hooked projections connected by an outward bending of their rims. They have each a hole on the lower edge of such a size as to admit a finger, to facilitate the handling of the tool. Neither of these types was met in other parts of the mound.

An *Olivella* shell with side perforation similar to that of plate 11, fig. 4, from a grave on Santa Rosa Island has been represented by Holmes.[52] Bone beads similar to that of figs. 16 and 17 on plate 11 were found in nearly all the strata of the mound; two of these are shown in figs. 13 and 14 of the same plate, the former, 1–8702, from stratum IV, the latter, 1–8743, from stratum V. It also has a remnant of a former axle-like connection with another bead as was shown in fig. 15 from stratum V. Bone beads have been widely used as objects of adornment by the California Indians, as is the case with many tribes in other parts of the world.[53] With the Yokuts bird bone pieces of 2½ inches in length at one time represented a value of 12½ cents.

No. 9. A child's grave, in stratum VII*a*, in the tunnel about 18 feet below the surface. The associated objects were convex shell beads (cf. pl. 11, figs. 5*a* and 5*b*) and a cockleshell upon the crown of the head (cf. grave No. 1).

No. 10. Grave of an infant with very delicate bones. It was found in the lowest part of section VIII, 23 feet below the surface.

Age of the Mound.

The shellmounds of the environs of San Francisco Bay are almost the only witnesses of a practically unknown period in the

[52] Art in Shell, pl. XXXII, fig. 2.

[53] W. H. Dall, for instance, found them among other places in shellmounds on the Aleutian Islands (Smithson. Contrib., 1878, No. 318, pl. 10, No. 17261.

early history of this region.[54] They appear to us at first investigation unintelligible, both as regards the beginning and the end of the period during which they served as human abodes. For a solution of the problem before us the most diverse kinds of investigations must be carried on, before the principal facts of this history can be clearly brought out.

Shellmounds can be found along almost all parts of the inhabited coast. In California as well as in other parts of the world they originate by the accumulation of remnants of food, especially the shells of the mollusca which are used as articles of diet. In the midst of the remnants of food cast aside by him, man clung to his place of abode, raising it more and more above the general level of the ground through the gradual accumulation of these materials. Hence these localities represent, in certain stages of human development, true but nevertheless low types of human dwelling places. The manner of procuring the essentials of life by collecting shells in itself indicates a low form of human existence. In all parts of the world, even today, people may be seen on the shore at low water gathering for food the shells uncovered by the retreating tide; and although under the changed conditions of life they raise no shellmounds, these people always belong to the lower classes of society, and lead in this manner a primitive as well as a simple life. Peoples depending for food upon collecting shells are usually not agriculturists, but fishermen, and perhaps hunters as a secondary occupation. Their implements are of the rudest kind, made of bone, stone, wood, and the like. Industries of a more highly developed kind, *e.g.*, the dressing of ore and working it up into various implements, remained unknown to them, except in perhaps a few instances.

Thus it seems natural to connect the origin of shellmounds in general with the work of prehistoric generations, *i.e.*, man of the stone age. The only condition necessary for their origin is, that the people who raised them lived somewhat close together and therefore possessed a certain social organization. For only in many centuries or even in tens of centuries could even large groups of men pile up such enormous quantities of kitchen debris

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[54] Powers, *l. c.*, p. 375.

into hills which come to form prominent features of the landscape. Though little is definitely known, the beginnings of human social organization evidently reached back into Quaternary time, just as is the case with the beginnings of human ornamentation. There is therefore no good reason why the origin of the shellmounds could not date back to Quaternary time. In this connection mention must be made of the fact that, according to Cook,[55] stone implements of argillite, which would consequently be attributed to the palaeolithic man, were found in a shellmound of New Jersey. The well known shellmounds of Denmark, the so-called "Kjoekkenmoeddings" (*i.e.*, "Kitchen debris"), which first attracted the attention of scientists to the remnants left by prehistoric men, are not so old.[56] Nevertheless, it has been possible to prove by them that Denmark had at the time of their origin a flora considerably different from that of the present, and that the Auerhahn, too, lived there, which does not exist in Denmark to-day. J. Wyman, a very careful explorer of the shellmounds of New England, does not consider the Atlantic shellmounds of this continent as old as those of Denmark.[57] He seems to have taken this view because he met with no authentic proofs of a greater age. These were difficult to obtain. Yet he calls attention to the finding of traces of the auk, the wild turkey, and the elk in those shellmounds, *i.e.*, animals which no longer exist in the region of shellmounds investigated by him. According to him, their disappearance took place in historic times.

In determining the age of the Emeryville mound we note first the fact that no traces of typical Quaternary animals were found in it. It is interesting to find that this mound resembles those just mentioned in regard to the finding of traces of the beaver, an animal no longer met with in this region. It was found in one of the lower strata of the mound. How far it reaches upward cannot as yet be decided, since the large number of bones taken from the upper beds have not all been examined. Since the time that remains of this animal were deposited in the lower strata of

[55] Quoted by Abbott, *l. c.*

[56] Cf. J. Ranke, Der Mensch, II, p. 536. These shellmounds are placed in the earlier stone age of the current geologic periods.

[57] *l. c.*, p. 571.

the mound, the beaver has retreated from this region, in fact from the whole of California, in a northerly direction, possibly up to Washington. When it left this region is not known. We cannot, however, be certain that this retreat may not have commenced in recent times.

Another fact of importance in fixing the age of this mound is found in the apparent change of level of the strata upon which the original layers of the mound were placed. As nearly as can be determined, the original fundament upon which the mound stands has sunk at least three feet. The base of the mound, formerly probably one foot above the usual high water level[58] of the bay, lies at present two feet below. If the mound with its environs had not since grown above the level of the original floor, it would be inundated completely for several hours twice a day. The length of time required for such a subsidence we can of course not determine with any exactness, as no measure of subsidence is available. In all probability it is to be taken as an indication of considerable antiquity.

Further facts upon which an approximation of the age of the mound may be based are of a purely anthropological nature. Usually the early period in which man made use solely of flaked stone tools is contrasted with the later age when polished as well as chipped stone implements were used. In the very lowest stratum of the hill, almost down at the base, there were found stone implements of the well known palaeolithic turtle-back form. A pestle fragment which came from the lower stratum of the mound, though having a completely disintegrated exterior, seems to have originally been artificially rounded. A mortar fragment found low down may have originated from an implement which was formed, as is often the case, out of a common boulder. But before it broke from this object the mortar was deeply worn out, just as others that have come down to our times. Also, the deep concavity of its rims speaks for long continued wear. The next stratum (two to four feet above the base of the mound) yielded the fragment of a pestle of irregular, not rounded cross-section. Here a common oblong pebble may have been used as a pestle.

[58] On an average once in every 14 days the high tide reaches a higher mark, which, however, is not considered here.

Besides these, the two lower strata furnished only an oval, flattened pebble, probably used as a hammer, the only one of its kind in the whole mound.

These four stone implements represent the only specimens of the two lowest strata of the mound which are not chipped. A little above these the excellently polished tool 1–8925 (pl. 10, fig. 9) was found (in stratum VIII). This is the only one of such workmanship before the IVth stratum upwards. Therefore it is by no means impossible that rubbed or polished stone implements, excepting mortars and pestles, were unknown at the time of the origin of the lower strata, and that their use was rather limited in the succeeding strata. But the presence of mortar fragments and pestles in the lowest strata points toward a higher development of the human type than is usually expected of men who use flaked tools only.

It will have become evident from the foregoing remarks that the general zoological, geological, and anthropological facts which are available for fixing the age of the mound offer only indefinite evidence; uncertain even for an approximate dating of the time of the mound's beginning. They do not preclude the possibility of an age numbering many centuries; neither do they prove it. Under such circumstances it seems proper to take into account some more general considerations which appear in a study of the shellmounds of the bay as a whole.

We shall probably not make too great a mistake if we estimate the number of the larger shellmounds around the Bay of San Francisco to be over 100. So many and such enormous shellmounds can not possibly have been constructed by human hands unintentionally in any small number of centuries. Furthermore, they form a link of a larger chain of similar mounds which stretch northerly along the coast and inland from Southern California to beyond Vancouver and possibly still farther; *i.e.*, a distance of 18 degrees of latitude. The extension of such a similar manner of life over so great an area speaks of itself for the work of a great number of centuries. Even the complete development of this peculiar mode of existence, as represented in these mounds, must have taken centuries. And this is the more probably true since in those earlier stages of cultural evolution advances in the

manner of living were infinitely more difficult than they were later. Under these circumstances it is only possible to assume that the origin of the shellmounds in this region represents a historical development of more than a thousand, possibly many thousand years.[59] If this holds good generally for the origin of shellmounds among which the one at Emeryville is, judged by its height, the character of its contents in the lower strata, and the observed geological facts, by no means the youngest, we have still to consider on the other hand the limits of the time up to which these mounds may have been inhabited.

For a long time it has been customary to consider the last as well as the first occupation of the shellmounds as belonging to the remote past. The fact that in California no shellmound is known which is now inhabited or has been inhabited in historic time would speak for this assumption. However, many instances point to habitation of the mounds in the most recent times, not only in a few places, but in different parts of the whole inhabited world. And this cannot surprise us; for we can see primitive man reach into the most recent, nay, even the present time, in various parts of the globe. Thus, as is well known, the first discoverers described the Indians of the Gulf of Mexico as men "living in houses of mats erected upon hills of oysters."[60] R. Schomburgh attributes a large number of mounds made of snail shells, observed by him near the mouth of the Orinoco river, to the Warrow Indians, who are still living in that neighborhood. In the desolate coast lands of the at present dry mouths of the Ica river in Peru there are two enormous shellmounds which the writer has visited. Even now there remain large parts of the wooden huts which were left behind on these shellmounds by the last shell-eaters. Painted pot-fragments, patches of woven fibres, and all

[59] In a similar manner, Abbott, *l. c.*, p. 449, closes a long general exposition of the reasons which speak either for or against a relatively great age of the shellmounds on the Atlantic coast, with the estimate of an age of at least 1,000 years. His deductions are based upon geological reasons (the sinking of the coast) and the dissimilarities of the cultural remains found in the mounds. Peculiarly enough, D. G. Brinton, reasoning from the analogy of the cultural character of the shellmounds with that of the Indian tribes which the explorers met in this country, thinks he has found an argument against a comparatively high age of the shellmounds. W. H. Dall considers the lower strata of his well-explored Aleutian shellmounds to have an age of about 1,000 years. (Contributions, *l. c.*, p. 53.)

[60] Abbott, *l. c.*, p. 44.

kinds of bones lie scattered about. It would be an easy matter to show that the last inhabitants of the hill exhibited the later cultural conditions which prevailed during the time of the Incas in the valleys of Pisco and Ica, about 1460 A.D.

Returning to California, there can be no doubt that the hill-like camp places of the Indians in the interior of the country represented a local variation of the shellmounds along the shore. The form and structure of these camping places resemble the shellmounds of the coast. The material differs in part, since the inhabitants of the inland had fewer shells at their disposal. These camping places were inhabited by the Indians quite recently, or are even now inhabited.[61] The time when the shellmounds of the Bay shore were vacated by their owners was therefore probably not very long ago. With this view coincides the fact that in the upper strata of the shellmound burial is represented by cremation; a form of burial observed up to the most recent times among the Indians of California. The white immigrants settled first on the seacoast, and it is therefore natural that the aborigines retreated earlier from their shellmounds than their brethren in the interior did from their camp places.

Thus, while the history of the shellmounds of this region probably reaches back more than a thousand years into the past, it must have extended almost to the threshold of modern times. The fact that their roots reached far back into the prehistoric period of California does not prevent our seeing the tops developing almost to the present day.

Cultural Stages Represented.

If we attribute to the shellmound an age representing many centuries, cultural differences should be indicated in the successive strata. For it is impossible that the cultural state of one and

[61] The old Indian camping place at Knight's Landing (on the Fair Ranch), at the mouth of a tributary of the Sacramento river, was inhabited, according to authentic information (T. Coleman), as late as 1849 by 150-200 "Digger" Indians. They departed in 1865. The shells, of which only a small number have been found, are of *Mytilus*. A similar mound in Colusa county, 20 miles to the northwest, is still populated by Indians. The Wintun Indians are still accustomed to obtain shells for food by diving into the river. This caused Powers (*l. c.*, p. 233) to surmise that a race somewhat like theirs might have erected these shellmounds.

the same place should have remained stationary for many centuries and, even judging by the mass alone, the mound could not have reached such a height in less than a considerable number of centuries. In attempting to discover possible cultural differences we unfortunately meet with several difficulties. The action of the climate has destroyed in all the strata the objects which consisted of perishable materials. Only the more resistant things remained. But the perishable materials are frequently those in which the decorative sense of man expresses itself most easily, and in which cultural differences are most distinctly shown. A further unfortunate circumstance arises from the general trend to simplicity and primitiveness of the tools of the inhabitants of all shellmounds. So that the visible cultural differences which would generally appear with a people of changing forms of life are imperfectly expressed. Finally, many objects give only partial evidence as regards form and use, for they were often mutilated previous to their deposition in the strata.

In examining the implements of successive layers of the mound we find that awls and certain knife-like tools found in nearly all known shellmounds are met with in all of the strata, while ornaments consisting of *Haliotis* shells and other simple objects of decoration made of shells, corresponding in general appearance to those which are still in use among the Indians, are met with in the graves of the VIth to the VIIIth strata. In the deepest strata, however, there have not been found any bone beads, ornaments of *Haliotis* shells, or saw-like tools such as are known above the VIIIth stratum. Thus there is some support for the suggestion that cultural differences are expressed in the history of the mound.

One of the most striking differences indicating a change in the character of the people whose cultural stages are represented in the successive strata is found in the different forms of burial. The use of cremation appears for the first time in the 4th stratum and extends to the upper, completely undisturbed stratum (II). In the IVth stratum out of 11 bone awls only 4 are calcined, while in the IInd stratum 44 in 61. In the latter the great amount of ash intermingled with calcined human bones becomes very noticeable. Powers relates in his great work on the California tribes

that most of them practiced cremation, and concerning the Karok, Yurok, and Wintun he relates that they bury their dead, while the Yokuts under certain circumstances make use of both customs. The inhabitants of the upper strata of the mound may undoubtedly be assumed to have followed the customs of the majority of modern Californian tribes in the disposal of their dead. Contrasting with this custom is burial in the ground. In this connection interesting evidence is furnished by the strata of this mound: here at least cremation was preceded by interment. In strata IV to VIII of this mound we find this custom prevailing, and we are forced to assume it to have been practiced by the population living on the mound during the time from the deposition of the lower part of stratum VIII to that of the middle of stratum V. In their manner of burial the knees were drawn up, resting upon the side, resembling on the whole the mode of burial in the shellmounds of Santa Barbara county in California, and in those found in Oregon. Instead of suggesting that the mode of burial is a recent one, the findings in the lower strata of the mound at Emeryville might hint that possibly the shellmounds of Southern California and Oregon are older than is at present believed. The Yokuts likewise bury their dead with drawn-up knees, but whether lying on one side is not mentioned. Also of the Wintun detailed information as regards their mode of burial is missing. But even if a majority of tribes should still practice the form which prevailed in the middle strata of the mound, this would not change the fact that the whole mode of burial at this place designates an earlier ethnical stage. The manner in which the inhabitants of the lower strata of the mound—say from the bottom portions of the VIIIth stratum to the bottom of the Xth—buried their dead is not known, because no graves or other evidences of burial appear in them. It is not impossible that their mode of burial differed again from the two kinds of burial found in the strata lying above.

Another striking difference between the upper and lower layers is found in the characteristic implements of the strata. This difference is best represented by a comparative table. In order to understand this better, we give the relative volume of earth moved for each stratum. In the table the volume of the VIIth

stratum (about 100 cubic feet) has been taken as the unit. Bracketed figures in the different columns denote the number of objects which might have been expected as the proportional content of one of the middle strata. In the last two columns the contents of the IXth stratum have for practical purposes been used as a basis.

Layers	Relative Contents	Rubbed* stone implements	Obsidians	Flaked stone implements excepting obsidian	Knife-like implements	Rough awl-like implements
I	5.5	2[5]	2[2]	—	[6]	—[8]
II	10.6	24[10]	11[5]	6[10]	[13]	—[16]
III	7.3	3[7]	4[4]	4[7]	[9]	—[11]
IV	4.2	4	2	4	[5]	—[6]
V	3.4	4[4]	1[1]	5(2)	[4]	—[5]
VI	1.5	—[1]	—[1]	3	[1]	—[2]
VII	1	—[1]	2[1]	6	[1]	—[1]
VII^a	2.2	—[2]	—[-]	9	1[2]	[11]
VIII	7.4	1[7]	1[4]	24 } (28)	1[9] } 5	—[3]
IX	3.3	—[3]	1[2]	62	4[4]	5[5]
X	1.8	—[2]	—[1]	17	—[2]	4[3]

Parentheses in the 4th column denote the number of chipped stones which may actually be assumed as tools.

It is evident that the character of the objects in the upper strata is entirely different from that of the implements which are found in the lower beds. Well polished stone implements and obsidians diminish the nearer we come to the bottom. The sporadic occurrence of a well polished stone implement in the 8th stratum of the first column has an entirely abnormal aspect, in view of the otherwise complete absence of such objects from the VIth stratum downward. The abnormal increase of objects of the 1st and 2nd kinds in the IInd stratum is doubtless due to the custom of throwing their possessions into the fire during the cremation of the dead. Still, the IInd stratum yielded a sufficient number of fragments of similar objects which were evidently lost in other ways. So few are furnished by the contents of the lower strata that their limited use is apparently indicated. In fact, even the Vth stratum shares this poverty, for its four polished implements are only represented by fragments of metate-like stones and a tablet of slate, polished on one side. In the lower strata flaked stones (of local materials), bone splinters of an awl-

* Except mortars and pestles.

like shape, and knife-like tools of bone predominate. Among the flaked stones, real implements are very numerous; they are missing in the upper strata. Their technique is primitive. On one side they are flat and are worked on the other side only. This working, too, is crude, and the finishing primitive. The turtle-back form is present. Different kinds of scraper-like tools of primitive form, and of drill-like sharpened stone fragments, must have been more common implements in the hands of the inhabitants of this stage than among the dwellers on the upper strata, where these tools are lacking.

A well formed implement of flaked stone, worked on both sides, was found low down in stratum VIII (a spear-like blade, pl. 10, fig. 14). Strata IX and X offer nothing similar. The leaf-like blade from stratum VIII (pl. 6, fig. 20), where a crude workmanship is paired with an attempt at more regular sharpening of the edges, does not favor the view that the inhabitants of the mound had been well versed from the beginning in the production of chipped implements.

Very remarkable is the occurrence together of crude splinters of bone, which show from long use their real value as tools, and the neat, almost elegant, knife-like implements. Among the latter we find the only ornamental fragment of a tool of bone obtained during the whole course of the excavation. The people who used the splinters of bone for their tools were not so primitive but that they possessed elegant objects of bone, and not so far advanced but that they were often satisfied with such primitive implements as common bone splinters. But both classes of these typical tools are markedly different from what the upper strata of the mound offer in the line of implements. Hence the people of the lower strata must have represented a somewhat different mental type or a different degree of mental training.

It seems advisable, from what we know, to separate the older inhabitants who had settled here and raised the foundations of the mound up to the middle part of the VIIIth stratum, from the later population of the grave period. They may have been neolithic, they may have been connected with the following generation by some common traits, although there is little evidence for this; but the two people certainly differed in cultural characteristics.

The race that commenced building in the middle of the 8th stratum was apparently less different from the population of the upper strata than from its predecessors. But differences can here, also, be discovered. The chipped tools of local materials still continue for some time (about to VII*a*), and obsidian seems to have come to them as a rather rare material. Only a few bone implements from grave 8 are extant in this group of strata. Contrasted with the usage of the people of the upper strata is also the use of bone arrow blades, which the last inhabitants of the mound apparently did not possess. They had not yet departed from an extended employment of bone as a working material; a fact usually more characteristic of a primitive people than of one further advanced.

One observation should still be made in this connection. It is a striking fact that in the fifth stratum and its immediate proximity a number of objects appear, the likeness of which was not found elsewhere in the whole mound. They are:

(1) Fragments of metate-like stones, stratum V.
A long, dull, chisel-like tool of horn, from stratum V.
A tablet of slate polished on one side, stratum V.

(2) Pieces of antlers, truncated for use as tools, stratum V, and a knife-like implement, stratum V.

It seems possible that such sporadic types of tools were left by a people that only temporarily inhabited the mound. Since, however, up to the present time parallel investigations have furnished but little material, such an hypothesis cannot be tested as to its exactness; nor is it possible to state from what region they might have come.

PART II.—ARTIFACTS UNEARTHED AT THE EMERYVILLE SHELLMOUND.*

The artifacts, complete and fragmentary, unearthed during the excavation of the Emeryville shellmound are of stone, bone or horn, and shell.[62] In number, the objects of bone and horn about equal those of stone, or if the large quantity of chipped stone in the lower strata be deducted, being mainly workshop chips, the bone specimens are even in the majority. Although shell heaps usually abound in bone implements, the large number of such implements recovered in this mound is quite remarkable, especially since the mound at West Berkeley, only two miles distant, seems to possess a much smaller number of them. There the bone implements recovered bear the proportion of from 1:5 to 1:10 of those of stone, so in the case of bone implements we find verification of the observation regarding the less frequent occurrence of the bones of animals as waste in proportion to other waste.[63] The occupants of the West Berkeley mound being essentially fishermen, apparently gave less time to the chase, and as a result may have neglected handicrafts in which bone implements were used.

A. Implements made of Stone.

a. Made by Grinding.

1. Mortars.

Stone mortars were among the most common and most useful implements that the ancient inhabitants of the land possessed, being used for the preparation of meal and for other purposes.

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* For the final literary form of the second half of this paper P. E. Goddard is responsible.

[62] Remains of pottery are found in quantities in the shellmounds on the Atlantic Coast (cf. Abbott, *l. c.*, p. 43*a*), and also in those of other localities (Brazil, Peru). They do not, of course, appear in California shellmounds since stone pots and baskets were used in their place at all times.

[63] The specimens of bone implements recovered in shellmounds are of great importance in the study of the use of such implements among primitive peoples, since they are so rarely found in other fields of research (cf. also Abbott, *l. c.*, p. 205). Still shellmounds greatly differ in this respect. While bone implements are "quite abundant" in the shellmounds of New England, the same as here (Wyman, Am. Naturalist, I, p. 581), the mounds in New Jersey yield only one bone to every 3,000 stone implements. (Abbott, *l. c.*)

Correspondingly numerous therefore are these objects, found mostly in fragments, and scattered through nearly all the strata from the second to the tenth. There are three perfect specimens and eleven fragments in our collection, nearly all made of lava. The largest of the mortars, 1–9102, fig. 3, was recovered quite accidentally near g in plan III at the extreme western end of

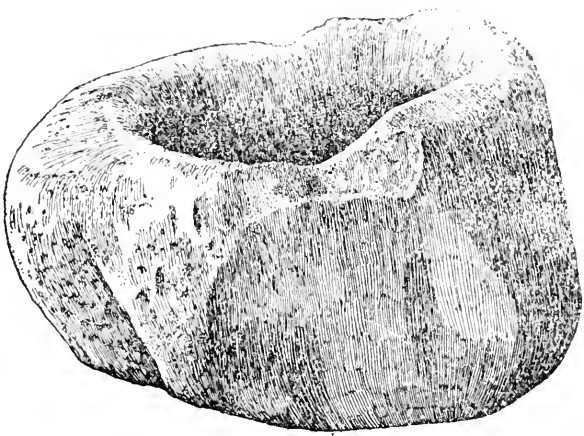

Fig. 3. × ¼. A large mortar.

the mound. Judging from the place of its discovery, about 3½ inches below the surface, the mortar must have been lost in about the middle period while the foot of the mound was increasing from n to p. Its outside surface is rough like the natural boulder, it is 1 foot long by 9 inches wide and 7½ inches high. Within it is oval and measures 6 to 7 inches in diameter and 5 inches in depth. The smaller mortar, 1–8705, fig. 4, was found in stratum VI. On the outside it is rounded off and ornamented with engraved vertical lines, which are intersected near the edge by a horizontal one. The edge is partly worn away by use. Such simple lines as an ornamentation of the outside are occasionally observed on California mortars.

1–8664, fig. 5, a small mortar from stratum III, is of different shape, oval both in its outline and in cross section, the bottom being slightly flattened; it has a rather small round cavity, 1½ inches in diameter and one-sixth inch deep. It may have served

for the pounding up of substances which were used only in small quantities, such as color pigments. The width of this mortar is 2½ inches, its height and thickness 1⅞ inches. Powers presents a view of a similar specimen from California, a proof that this type occurred in this region. A fragment, 1–8810 of the collection from stratum VIII, may be the bottom of a similar utensil.

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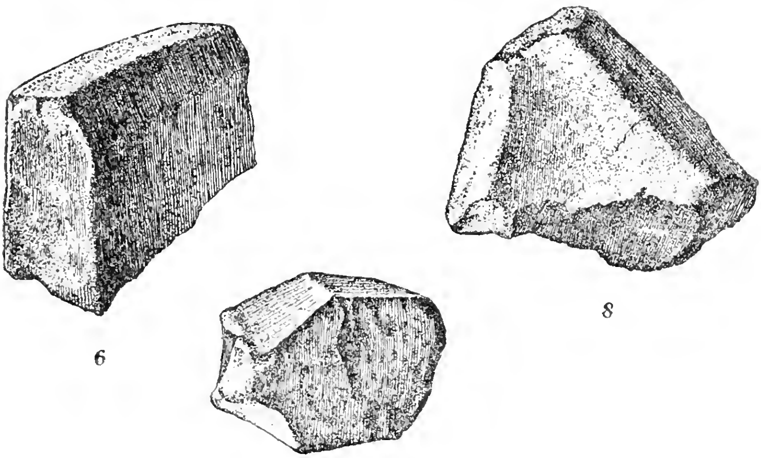
Fig. 4. About one-half natural size. Fig. 5. × ¾. Small mortars.

Some additional types of mortars are represented among the fragments; they will be given below in the order in which they were recovered. 1–8594, fig. 6, from stratum II, is one of several fragments of this stratum and belongs to a relatively advanced type, resembling a vessel. These stone vessels had a fairly even thickness of the sides of about an inch, and were fashioned quite regularly without and within. This rim is flattened and slopes inward. The diameter of the complete mortars may have been a foot. This type of mortar is quite common in California. The collection from Santa Rosa Island in the University Museum made by Dr. Jones contains several similar specimens. 1–8707 fig. 7, stratum IV, is an odd fragment. Its well fashioned bottom part is surrounded by a rim which in turn is bordered by two chambers which exactly correspond; the surface between them is broken. This fragment may also have been part of a mortar, although it is not possible now to restore it to any shape represented among the familiar types. Fig. 8, 1–9077, shows a fragment of a mortar recovered in the Xth stratum, and it is the only one found lower than stratum VIII. It lay hardly an inch from the base of the mound. It has a peculiarly jagged shape; the

convex exterior is the rough bowlder stone, as are the uneven sides, but the inner concave surface is ground down smooth. The peculiar jagged shape may be explained by the fact that it is a piece of a mortar, the rim of which by long usage had been worn away in places, and as a result points were formed. The collec-



6 7 8

Figs. 6, 7, and 8. × ½. Fragments of mortars.

tion of Dr. Jones from Santa Rosa contains a mortar with a jagged rim, caused probably also by wearing away, but in that case the points of the rim show some decoration, unlike the present fragment. 1–8848, fig. 9, stratum VII*a*, may throw some

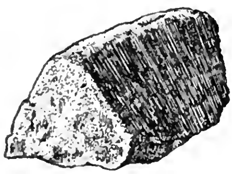
9 10

Fig. 9. × ⅔. Fig. 10. × ½. Fragments of mortars.

light on the possible cause of these indentations resulting from long usage. In the latter specimen the surface of the bulging portion is rough, as in 1–9077.

The small fragment, 1–8621, fig. 10, stratum II, has to be included also in the class of mortar-like utensils. It is made of a soft material resembling steatite, it curves as if it were a handle and is broken off at one end, while the other rounded end shows marks of blows. This object may be compared to the handle of the cup-shaped vessel of steatite from Dos Pueblos in Southern California and shown by Professor Putnam, l. c., pl. VI, fig. 5 (cf. l. c., p. 110). Similar utensils from Santa Catalina Island and other places are mentioned there; hence it may be assumed that this type of utensils was used by the occupants of the mound during its last period.

Fig. 11, 1–8533, from stratum I, shows a stone fragment, hollowed out like a mortar. The upper rim of the specimen must have had a sharp angle, as the outer surface is almost vertical while the concavity is rather shallow, forming a cup with a considerable diameter.



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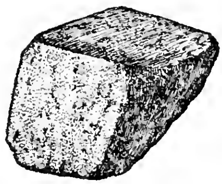


12

Fig. 11. × ½. Fragment of a mortar. Fig. 12. × ½. Fragment of a stone used for grinding.

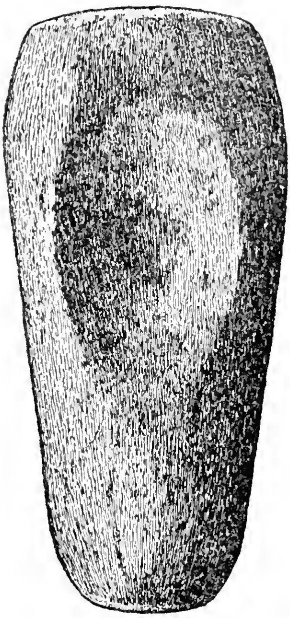
2. Flat Stones.

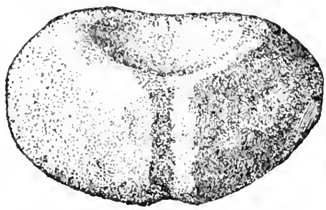
It is only from three small fragments that the presence of this type within the mound may be inferred. All three were recovered in stratum V; one of them, 1–8751, is shown in figure 12. Judging from the fragments, these grinding stones were square in shape, about 1½ to 2 inches in thickness and were worn smooth, both on the horizontal surface and on the sides and ends. The occurrence of flat grindstones is not unprecedented in California; some have been found in Sonoma county[66] and elsewhere. They were perhaps used in the manufacture of shell ornaments and beads.

[66] Moorehead, *l. c.*, p. 291.

3. Pestles.

Many fragments having the usual form were found, but only one was perfect, and that of unusual shape. 1–8670, fig. 13, was recovered in cut A, 6 inches below the surface. It is 6⅜ inches long, 3 inches wide, and 2⅛ inches thick, tapering toward the pestle-like rounded end, the other end being flat. Marks on it show that it was also used as a hammer. Sunk into one of the sides, at about the center of gravity, is a long conical groove about one-third of an inch deep; the opposite side shows the beginning of another such groove. They may have been worn into the stone by using the broad side of the implement in driving stakes, etc.





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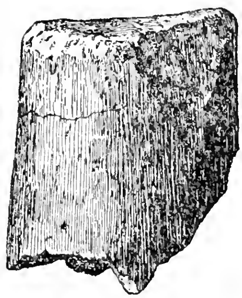


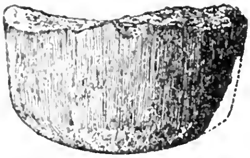
13

15

Fig. 13. × ½. Pestle with depression on one side. Fig. 14. × ½. A grooved sinker. Fig. 15. × ½. Upper end of a pestle.

The beginning of a second groove, otherwise superfluous, on the opposite side seems to bear this out, as do the marks on the surface of the broad end. These latter indications are a proof that the utensil was not used as a pestle only. This is not the only instance of a pestle with side grooves. Ch. Rau pictures a very

similar one from Tesuque in New Mexico.[67] Mr. Stevenson's opinion that the side grooves served for holding the pigment which had just been ground by the pestle seems to be merely a conjecture on his part. A stone was found in the West Berkeley shellmound which seems arbitrarily to combine several purposes, —a groove encircling it shows its use as a sinker, a semispherical cavity which at its widest part breaks into the groove points to its use as a mortar.



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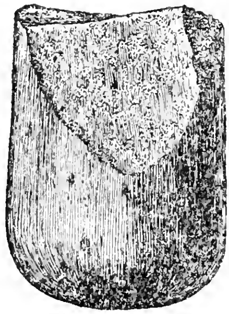

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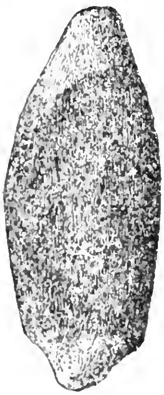

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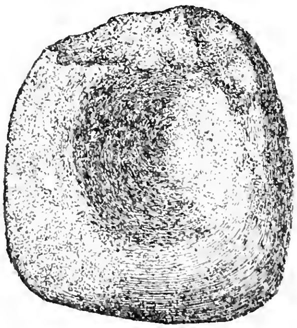

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Fig. 16 and 17. × ½. The lower ends of pestles. Fig. 18. × ½. Stone used for hammer with depression for fingers. Fig. 19. × ½. A new type of implement of unknown use.

[67] Observations on the cup-shaped sculpture in Contrib. to North American Ethnology, 1882, V, fig. 39, with p. 47 repeated by Stephen D. Peet in The Moundbuilders, 1892, I, p. 5, fig. 5.

The 17 fragments of pestles of usual shape were fairly uniformly distributed throughout all the strata, as was the case with the mortars. However, 7 of these came from stratum II alone. There were no peculiarities to be noted in the fragments as to their forms. They were about 2½ inches thick and were rounded off at the lower end. The upper end sometimes tapered after a conical swelling immediately next the grinding surface. They were cut straight off at the upper end, unless indeed the abruptly cut surface is the result of a previous breaking. Sharply pointed or button-like ornamentations at the upper ends which are usual in those found in California[68] were not noticed. Figures 15 to 17 show three fragments,—1–8882, 1–8597, and 1–8666 from strata VIII, II, and from the cut A. Of these, the first illustrates the upper end of a pestle, the other two, lower ends.

The little object 1–8620 from stratum II, plate 12, fig. 11, seems to be best included under pestle stones. It is made of fine grained stone, which would point to its use for more delicate purposes. It is a truncated cone, with oval section, 1⅛ inches wide and 1$^{3}/_{16}$ inches thick. The lower base is slightly arched and, as can plainly be seen, is scratched slightly by use; a small middle cavity in the narrow upper surface shows traces of asphaltum. It may have been used as a pestle.

4. Hammer-like Stones.

Strangely enough, only two such implements were found in this mound, while in the West Berkeley mound several that conclusively belonged to this class were unearthed.

One of these, a boulder stone the size of one's fist, oval in shape and flattened, was found in the lowest stratum, X. The marks of blows making the side edges uneven show its use as a hammer. The other, 1–8720, fig. 18, from stratum IV, is one of the familiar type having a groove for the insertion of the fingers. It is a stone 3¼ inches long, 3 inches wide, and of an uneven thickness not exceeding 1⅝ inches, flattened off at its thickest (lower) end. There is a depression in each of the broad sides. The surface of the indentations is dotted with small holes. Similar stones have been found in many places in the United States,—in

[68] Putnam, *l. c.*, pp. 87-89; Moorehead, *l. c.*, p. 290.

New Jersey, Pennsylvania,[69] on the Aleutians,[70] and elsewhere. Abbott has pointed out the fact that the edges of some of these stones could not very well have been used for hammering since they do not show the signs of such usage. The stone in question was evidently used in two ways,—as a hammer at the lower flat surface, which is from five-eighths to 1⅛ inches wide and in this case provided with indentations serving for the insertion of the finger; and as a hammer at the flat sides for the driving of stakes, etc., in which case it was grasped by the rims. The pits in the depressions were probably the result of this latter use of the implement. The writer has noticed that just such flat stones were used in Bolivia for the driving of stakes, and there, too, the broad side which gave the blow was pitted. The material used is hard sandstone.

5. Flat Stones Pointed at both Ends.

Two objects of this form, coming from stratum II, represents a new type of implement. They are almost identical in shape. One of them, 1–8604, is shown in fig. 19. They consist of long, flat, quadrangular boulder-stones, 3⅝ and 3⅞ inches long, with an even width and thickness of 1⅝ inches. Both ends are simply sharpened to a point, and the broad sides, top and bottom, are shaved off as far as the middle of the stone. In form, the stones are similar to a wooden top of today.

6. Sinker-like Stones.

Stones of this description form a large class, exhibiting, however, great diversities of shape. They all seem to have served the same purpose since most of them show indisputable signs of such usage.

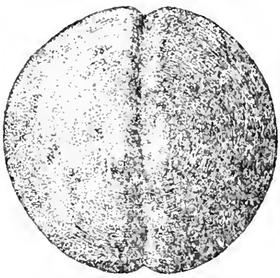
About 18 stones of this kind were found in the mound. As regards their varying form and utility, they may be classed as follows:

I. Spherical and oval stones with a peripheral groove: Fig. 20, 1–8669, shows a spherical stone of this kind, found at a depth of 5 feet in cut A. 1–8534, fig. 21, a fragment of an oval stone with a groove about its largest circumference is from stratum I.

[69] Abbott, *l. c.*, pp. 425 to 431, figs. 399 to 404. Chas. Rau, *l. c.* Smithson. Contrib., No. 297, Vol. XXII, p. 20, figs. 80 to 81, and p. 22.

[70] Dall, *l. c.*, p. 55.

II. Flat boulder stones with notches in the corresponding sides for fastening them: Two of these were found in the upper strata: one, from stratum IV, is shown in figure 22.



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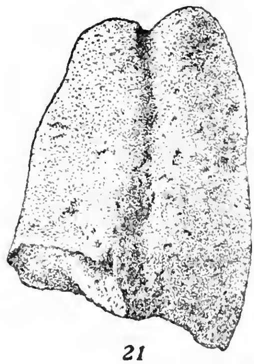

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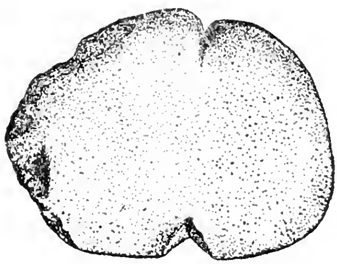

22

Fig. 20. $\times \frac{1}{2}$. Figs. 21 and 22. $\times \frac{3}{4}$. Sinker-like stones.

III. Stones with holes pierced through them by which they were suspended: These form the type that may with the most certainty be classed as sinkers. 1–8535, plate 12, fig. 7, from stratum I, is the only specimen of this class found.

IV. Pear-shaped and kindred stones; also conical pendant stones: The fourth class is the largest, in that the greatest number of shapes may be included in it. The following are to be counted in with this class:

a. Pear-shaped stones and others, though slighter, still very like them. This type is represented by:

1. A perfect pear-shaped stone, 1–8611, plate 10, fig. 2, from stratum II.

2. More or less fragmentary bits, 1–8612. 3, the first without a doubt, the second probably from stratum II. See 1–8613, plate 10, fig. 1.

3. Five fragments of stones of a slenderer, less perfect though similar form, 1–8614, 5 and 6 (plate 10, figs. 5, 3, 8), 1–8617 and 1–8718 (plate 10, fig. 4), the latter one from stratum IV, the others from II.

b. Inverted pear-shaped stones, some flat. This shape is related, though distantly, to the above. Two fragments, 1–8618 and 1–8619, from stratum II, see 1–8618, plate 10, fig. 6.

c. A conical stone with slanting lower surface (1–8719, plate 10, fig. 7) from stratum IV. It is very similar in shape to the upper part of the pear-shaped stones.

d. A pointed stone, 1–8925, from stratum VIII, plate 10, fig. 9, which is only very distantly related to the pear-shape forms.

These stones belong to that class of objects which have been interpreted at different times as being:

1. Weights for determining the vertical.
2. Weights for weaving apparatus.
3. Weights used in spinning.
4. Weights used for fishing nets or lines.
5. Ornaments.
6. Medicine stones or charms.[71]

A number of articles under class IV (Form IV*a*) are made of hematite.[72] Of the objects under consideration, 1–8925 (plate 10, fig. 9) is made of the same. The use of hematite generally presupposes that an implement is going to be employed as a weight. Since the forms that belong to this class merge into one another in an uninterrupted series, one is justified in assuming that they were all weights.

It is further clear that the shape of the pear-like stones, which have caused so much speculation, must have been fitted for some particular purpose. This is to be inferred from the fact that stones of like shape have been found in widely separated parts

[71] Dr. L. G. Yates, Smiths. Rep., 1886, pt. I, p. 296, further explained in Bulletin of the Santa Barbara Soc. of Nat. History, No. 2; Moorehead, *l. c.*, pp. 249 to 250, etc.

[72] Abbott, *l. c.*, p. 232, fig. 220, from Illinois; Rau, Smith's Contrib., p. 27, No. 101, from Tennessee (cf. for both pl. VIII, fig. 2); Moorehead, *l. c.*, p. 251, fig. 29, from Santa Barbara, Cal.

of the United States outside of California, in Maine,[73] Massachusetts,[74] Ohio,[75] Illinois,[76] and elsewhere.

Furthermore, H. H. Bancroft[77] has made the important assertion that such implements are usually found in a mutilated condition. This is borne out by the fact that out of the nine pear-shaped and inverted pear-shaped stones represented by groups *4a* and *4b*, there is only one which is perfect. It is to be inferred from this that, however elaborately they are ornamented, these implements were put to essentially practical uses. Hence the theory that they were worn as ornaments or charms is untenable.[78]

The supposition that they were used on the end of a plumb line is also invalid, since civilization was not far enough advanced among the Indians for that sort of thing. Weaving and spinning apparatus requiring the use of the stones as weights are so rarely found that we cannot explain the presence of such a large number of stones in that way. And especially not in California since the Indians there have never spun nor woven.

Hence the only explanation left is that they were used in fishing. The great quantities of such implements found on the coast has often been noted.[79] That nine were found in a shellmound such as the one at Emeryville substantiates this theory. They have also been noticed in a number of other shellmounds about the bay (even though these have been little excavated), as at Ellis Landing and in Visitacion Valley,[80] and their shape is identically the same (plate 10, fig. 2). There is one from a shellmound on Seaver's Ranch with exactly the same shape, plate 10, fig. 1. Drawings were made by J. Deans of two other objects

[73] Moorehead, *l. c.*, p. 92, fig. 113.

[74] Rau, *l. c.*, p. 27, figs. 105-106, Abbott, pp. 228 and 230, figs. 216 and 218.

[75] Abbott, *l. c.*, p. 233, fig. 222, Rau, fig. 103.

[76] Abbott, *l. c.*, pp. 232 and 233, figs. 221 and 223.

[77] Native Races, IV, p. 711.

[78] According to Dr. L. G. Yates, Bulletin 2 of the Santa Barbara Soc. of Nat. Hist., the California Indians regard such pear-shaped stones as charms and use them as such. This is analogous to their superstitious belief concerning stone hatchets whose original significance has long been forgotten and hence is no explanation of the original use to which these articles were put.

[79] Cf. F. W. Putnam, *l. c.*, p. 195.

[80] See Illustration in H. H. Bancroft's Native Races, IV, p. 711.

which were also taken from the same shellmound in Visitacion Valley and which had like forms.[81] If we accept the hypothesis that these stones in general are sinkers, there are of course difficulties in the case of individual stones, that must be explained away. The following peculiarities which appear must be mentioned:

1. Occasional peculiarities in material: Some are not very heavy, some rather soft; and in others the ornamentation either in color, grain, or crystalline markings is so prominent that an ornamental use is suggested. 1–8615, plate 10, fig. 3, seems to be a stone of this description,—the material of which it is made is reddish and fine-grained, and ornamented to some extent.

2. The occasional absolute lack of any contrivance by which the implement might have been suspended: 1–8925, plate 10, fig. 9, is, for instance, of this kind. It is for the greater part of its length absolutely round and gradually tapers to a point. The outer end is in the form of a handle which is flattened to about one-half inch wide and one-quarter inch thick and is rough from the marks of blows; the main part of the instrument is smooth. The handle-like part must, from its form and roughness, have served to fasten it by. It looks, however, more as though it were intended to fit into a shaft, rather than to be suspended. It is important to note that one of the long sides is entirely covered with asphaltum. This fact excludes the possibility that it was fastened into a shaft. It must further be called to mind that, as in the case of the California Indian dancing costume, various rod-like bits of stone are sometimes fastened on by means of hangers, the provision for their suspension being made on the stones themselves. The use of asphaltum in securing them often did away with otherwise necessary changes in their form. At any rate it allowed great imperfection in form.

Fragment 1–8616, plate 10, fig. 8, is an example of the above; it is pear-shaped and the upper conical point is encircled by a broad band of asphaltum which served for its attachment.

The sinker-like stones of classes I-III present fewer difficulties in their explanation than do the pear-shaped and kindred ones.

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[81] Journal of the Anthropological Institute, *l. c.*, p. 489.

The use of flat boulder stones with side grooves as net-sinkers is agreed to by all.[82] The fact that here as in the East, and as in the shellmound of West Berkeley, many of these have been found in groups, points almost conclusively to their use as net weights.

Professor Putnam has already called attention to the use of spherical stones (fig. 20), with a peripherally encircling groove as sinkers.[83] Similar stones are also found in shellmounds in Massachusetts and in the Aleutian Islands.

Dr. Yates[84] was informed by an Indian that such was the use of a stone found in Napa (California).[85] The use of the oval stones (as fig. 21) is in general to be explained in the same way. A stone of that kind is, for example, known to have been found in Oregon.[86] Another one has been found in California (supposedly at Spanish Flat). It has been pictured by H. H. Bancroft.[87]

The stone, 1–8535, plate 12, fig. 7, from stratum I, is a sinker, judging from its general shape: it is long and oval, pierced at the upper end. Stones of like form have been found in numbers in the shellmound at West Berkeley. They are probably sinkers like many other stones found there.[88] The upper eyelet has been broken off in the stone under consideration. The stone is slightly flattened; one of the end surfaces is more curved than the other and one of the broad sides more elaborately adorned. On one side a lattice-like ornamentation joins on to a deep groove. On the other side may be seen several somewhat ruder lines like hatchings. The material is that commonly used. Abbott describes an ornamented stone pendent as a gorget and another one

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[82] Cf. particularly Abbott, *l. c.*, p. 237.

[83] *l. c.*, p. 203.

[84] Bulletin, *l. c.*, pl. III, fig. 22, and p. 17.

[85] Spherical and oval stones with a peripheral groove are implements of a very simple form and hence they lend themselves to different uses. The old copper fac-simile of a stone hammer in the Museum of Science and Art in Philadelphia shows conclusively for the region in which it was found, *viz.*, Lake Titicaca, Pako Island, in Bolivia, that similar stones were used as hammers.

[86] Rau, Smiths. Contrib., No. 318, p. 27, fig. 110.

[87] Native Races, IV, p. 705.

[88] Sinkers provided with a hole and of like shape are in use among the Western Eskimos. See J. Murdock, in IX, Am. Rep. of Bur. of Ethnology, 1887 to 1888, p. 282, fig. 273. They are found in great numbers in the United States.

from Illinois with plastic ornaments, as a sinker.[89] Compare this with a picture of a pendent stone from San Clemente Island.[90] The fact that these stones are ornamented seems to make their use as sinkers doubtful but not impossible, since fish-hooks are sometimes much ornamented.[91]

Plate 12, fig. 8, 1–8630, is somewhat sinker-like, but in many respects it diverges from the general class. It is made of very light, soft stone, and is an elongated oval in shape, with five grooves parallel to one another cut in about the edge. It is elaborately ornamented with oblique hatch-like lines on the edges between the grooves. Hence it is improbable that it was a sinker—it cannot, however, as yet be assigned to another use.

7. Cylindrical Stones.

These differ from the pestles in that their diameter is smaller and that they bulge out only slightly toward the middle. Two objects of this kind came from stratum II, of which 1–8609 is shown in plate 10, fig. 10. Both are broken at their ends. They are respectively $4\frac{13}{16}$ inches and $2\frac{5}{8}$ inches long and fifteen-sixteenths inch and 1 inch thick. The surface of the break in the shorter one was subsequently smoothed off; perhaps by using it as a pestle. Long cylindrical stones of this kind partly flattened on one side and having encircling grooves at the tapering ends have been pictured by Yates[92] and Moorehead[93]; these were found at Santa Barbara, Southern California. To these may also be compared a stone pendant from Tuolumne county[94] pictured by Moorehead, since the lack of complete ends in the stones gives considerable room for speculation as to what the whole form might have been. On the other hand, the tentative designation of them by Moorehead and Yates as charms is in no way justified. The better interpretation of their use would be that of sinkers especially in the case of those provided at both ends with grooves

[89] *l. c.*, pp. 398 and 234.

[90] Putnam, *l. c.*, p. 209, fig. 81.

[91] Among the Thlinkites conys Niblack.

[92] *l. c.*, pl. IV, figs. 32, 33, so. Smiths. Reports, 1886, I, partly, pl. IV, figs. 32, 33, pp. 296 to 305.

[93] *l. c.*, p. 251, fig. 381, Nos. 30 to 33.

[94] *l. c.*, p. 249, fig. 380, No. 1.

for attachment,[95] since stones coming from Peru[96] which are undeniably sinkers are very like these in many respects.

8. Needle-like Stone Implements.

An awl, 1–8608, plate 12, fig. 10, of stone, comes from stratum II. Plate 12, fig. 9, 1–8711, from stratum IV, is pierced and similar to the above though needle-shaped.[97] From scratches appearing on 1–8608 we infer that it was used on rather hard materials.

9. Tobacco Pipes.

It is remarkable that tobacco pipes were found only in stratum II: of these we have five perfect specimens and one fragment. This bears out the statement made above, that stone utensils well-made and smoothed off were found only in the upper strata of the mound and particularly in stratum II. Since it is not probable that the inhabitants of the lower strata were ignorant of the practice of smoking, the absence of pipes must be explained in some other way. On the one hand it is possible that many of the older pipes were made of wood. Powers has described a number of wooden pipes in use among the Indians of today. On the other hand, it is possible that the practice of smoking was not so common in remoter periods and therefore it would be likely that fewer pipes would be found. There is a third possibility, that the large number of pipes found in stratum II is dependent on the method of disposing of the dead, so characteristic of this stratum and which caused articles to be preserved which would otherwise have disappeared. The pipes described below represent two primitive types, with some insignificant variations.

Plate 12, figs. *2a* and (cross section) *2b*, 1–8622, represents one type. It is made of a soft serpentine-like material, gray on the broken surface and reddish brown on the outside. It is one and seven-eighths inches long and incomplete. There is a broad bowl-like part and a narrow neck or stem, a prolongation of it. The bowl is conical, one and one-eighth inches long and of inconsiderable width, being three-fourths of an inch in diameter. The "boring" of the stem portion is cylindrical and eccentric.

[95] Cf. V. A., also flat specimen, Smiths. Rep., 1, pl. IV, fig. 30.

[96] In the Museum of the Univ. of Philadelphia.

[97] Prof. Putnam, p. 211, in figs. 87, 88, from Santa Barbara.

Plate 12, figs. *3a* and *3b*, 1–8623, is the only representative of the second type. It is made of green serpentine, and is two and one-sixteenth inches long, tapering into a tubular shape. The hole in the stem is as above, only at the mouth end it is conical and shorter. A groove is cut into the tapering end.

Plate 12, figs. *1a* and (in section) *1b*, 1–8624, is made of soft gray stone and is very similar to the preceding one, except that it lacks the groove at the mouth end and that it is shorter and thicker.

Plate 12, figs. *4a* and (in section) *4b*, 1–8626, is a small cylindrical object only nine-sixteenths of an inch long and seventeen-thirty-seconds of an inch wide. The seven-sixteenth inch conical hole takes up nearly the whole width of the stem so that the rim surrounding it is sharp. The short conical boring at the stem end is only five-sixteenths of an inch wide. The proof that this too was used as a tobacco pipe lies in the fact of the disparity of the two conical borings and in that the entire width of the bowl end of the pipe is used to the best advantage. It seems to have been more of a miniature or toy than an article in common use. However, the quantity of tobacco needed to fill any of the pipes could not have been great since the cone-shaped cavity in the bowl is so small. One is here reminded of Schumacher's entertaining description of the way in which a Klamath tipped back his head in order to raise his pipe vertically that he might lose none of the tobacco. The stem ends of the pipes are equally imperfect. They must certainly all have been fastened to a pipe-like mouth-piece similar to the stone pipes which Professor Putnam has pictured and described and which when unearthed still had the mouth-pieces attached by means of asphaltum.[98] Some Indian pipes of today are fastened to the mouth-pieces by means of ligatures,[99] as was evidently the case with pipe shown in plate 12, fig. 3, and with another one of the collection (1–8625) the stem of which had been broken. A rude notch was cut into the outside of the stem to facilitate the rebinding and to give it a better hold. At any rate, the means of attaching the mouth-piece (comp. particularly figs. 1 and 4) was as inadequate as was the receptacle

[98] *l. c.*, pl. IX.

[99] Powers, *l. c.*, fig. 43, opp. p. 426.

for the tobacco at the front end. Short reed-like tobacco-pipes are particularly characteristic of the middle portion of California. A stone tobacco pipe coming from a shellmound in Visitacion Valley south of San Francisco, pictured by H. H. Bancroft,[100] is very similar to plate 12, fig. 3. The fourth one in the plate, pictured by Powers, is also analogous. Short pipes are of course also found in southern California,[101] but the longer reed-like variety is more usual. A tobacco pipe pictured by Marquis de Nadaillac and coming from the cliff dwellers[102] is somewhat similar to plate 12, fig. 2, but here the stem was so slight that there was no need of a special mouth-piece. The short pipes as well as the long ones of southern California[103] are also found in the eastern part of the United States. Several clay pipes from New Jersey[104] may be compared to them; also two objects merely classified as "pipes," but most probably tobacco pipes, from West Virginia[105] and Tennessee.[106]

10. Various Polished Stone.

In the mound were found different kinds of stones,—some isolated specimens showing good workmanship but as yet unclassified, and others, of the common kinds which were, of course, in use at the same time with the more perfect implements.

Those of the first kind were all found in stratum II. One of these is 1–8671, plate 12, figs. 12*a* and (front view) 12*b*. It is made of soft serpentine. Its shape is that of a flat cylinder of not entirely uniform height, with flat or almost imperceptibly curved ends; there is a perforation which extends inward in the form of a cone from both ends.[107] In the gentle curving-out of its peripheral surface it is particularly like ear-pegs. It is worthy of note that Moorehead shows two objects from the neigh-

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[100] *l. c.*, IV, p. 711.

[101] Comp. two of Putnam's views in pl. VIII.

[102] *l. c.*, p. 256, fig. 112. The one drawn by Peet, *l. c.*, I, p. 282, shows the same object.

[103] Cf. Abbott, *l. c.*, p. 330, fig. 322, from Massachusetts.

[104] Abbott, *l. c.*, pp. 336 and 340.

[105] Fewkes, p. 128, fig. 155.

[106] Rau, Smiths. Contrib., *l. c.*, p. 44, fig. 176.

[107] As regards its form it may be compared to the objects shown by Moorehead, *l. c.*, p. 279, fig. 418, Nos. 2 (from Napa county) and 7, from North and Central California.

borhood of Stockton analogous to it in many respects and designated by him as lip-pegs,[108] and that barbed, bone spear-heads like those used on the northwest coast were found in the vicinity of Stockton, according to Mr. Meredith, in close proximity to a lip-peg[109] of the kind used on the northwest coast. The possibility, therefore, of an ethnological connection between the ancient inhabitants of the vicinity of the central California water basins and those of the north cannot well be denied.

The small object, 1–8628, plate 12, fig. 13, seems similar in size and form to the object shown in plate 12, fig. 12. This similarity is only a superficial one, aside from the difference in the material of which it is made,—burnt clay, rare in California and not carved but modeled; it is further different in the fact that its cross section is oval and that its slightly arched end is covered with marks of blows, and that the perforation is absent.

Plate 12, fig. 6, 1–8631, is of quartz-colored material, flat and tongue-shaped. It is broken off at the broad end, the lower surface is flat, the upper slightly arched, and the edge blunt. Judging from its form and the brittle nature of the material of which it is made, it must have been an ornament.

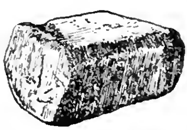
Plate 12, fig. 5, 1–8850, of chalcedony, looks like a neckless head of a bird resting on a bust-like body: the bill is linear; the eye is represented by a deep hollow. That this object is not an artifact is the conclusion suggested by the presence of a crust over the entire object from beak to eye, formed by its weathering. In relation to other products of human workmanship, such an object has worth only in so far as its shape was of undoubted significance to the inhabitants, and carefully preserved for that reason.

Besides this, various flat, smooth stones of chert and agate were found, one of which, 1–8849, from stratum VII, is shown in fig. 23. It is made of fine grained sand-stone, has but one smooth side and was used as a whet-stone. A thin oblong sheet of mica-slate was unearthed, but it must have been used only as an ornament.

[108] *l. c.*, p. 285, fig. 426, Nos. 3 and 5.

[109] The use of lip-pegs has never been observed in that region between Mexico and the northwest coast of North America. W. H. Dall, Public of the Bur. of Ethnology, 1881-82, III, p. 86.

Fig. 24 (1–8721 from stratum V) illustrates one of two analogous objects from the upper strata of the mound. It is a common stone with about seven groove-like lines of varying breadth and depth on the sides. Two of them form an angle which though purely accidental might seem to be ornamental. The grooves come probably from its use as a whet-stone for bone awls, etc. To this purpose the hard, sandy substance easily lent itself. Long bars could not have been fixed to this stone, since for that purpose the grooves are neither broad nor straight enough. Several drawings by Rau[110] and by Moorehead[111] may here be compared.



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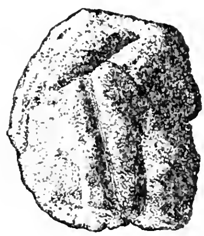

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Fig. 23. × 1/5. Fig. 24. × 1/2. Stones, probably used for whetting.

b. Chipped Stones.

A great number of these were found in the mound. As regards their shape they fall into two classes, either finished implements or chips from the workshop. As regards the material of which they are made, they also fall into two large separate classes: those of the usual, light stone natural to the place such as flint, chert (in green or brown variety), horn-stone, jasper, etc., and those of obsidian (volcanic glass), which was not to be had in the immediate locality, although it was the preferred material. The classification according to material is the more important. There were found about twenty-five obsidian objects (among them a very few rough pieces or waste bits from the work-shop, the latter all small) and about 140 hewn stones of other kinds of material. Most of these were waste from the work-shop, all of

[110] Smiths. Contrib., *l. c.*, p. 304.

[111] *l. c.*, p. 338, fig. 493.

the size of implements, but relatively few (about one-fourth) complete tools.

The obsidian implements came from the Ist to the IXth strata, but most of them were found in the upper layers. Nearly three-fourths of them were taken from the three upper strata. In stratum II alone there were ten implements and one piece of obsidian in the rough. It can certainly be inferred that the great quantity of obsidian tools from II was connected with the custom of burning the dead and of casting their belongings into the flames. In addition, the great number found here shows a broader and more universal use of obsidian in the making of implements.

They are all of very simple form, such as arrow- and spear-heads,[112] spear-like points and a flat knife-like blade, made from the rough stone by polishing off bits[113] (see plate 10, figs. 11 to 16). Arrow-heads of obsidian were found only in stratum II, comp. 1–8676, plate 10, fig. 13, the blade-like knife, 1–8633, fig. 11, and the spear-like knife end, 1–8634, fig. 16, which were found there. 1–8926 from stratum VIII, fig. 15, may have been either a spear-head or a knife. Fragment 1–8536 from stratum I, fig. 12, by virtue of its two unevenly arched surfaces, and 1–8883, fig. 14 of the plate, from stratum VIII (found nineteen feet down in the tunnel between parts 8 and 9 of the shaft frame) on account of its long peg-like lower end, may be parts of knife-like implements. They were fastened on rod-like shafts similar to the fine-handled knives of southern California shown by Professor Putnam and which are in an excellent state of preservation.

From a technical standpoint, it is worthy of note that implements of such perfect workmanship as figs. 12[114] and 13 were not found among the obsidian implements of the lower strata of the mound. A proportional decrease in obsidian implements of good workmanship can be noted as one approaches the lowest strata.

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[112] For the use of spears in California comp. Powers, *l. c.*, pp. 221, 321, etc.

[113] No decorative or fantastic shapes were found among the obsidian objects as elsewhere in central California. Moorehead has shown some of these in *l. c.*, p. 262. A curved hook-like object was found in the shellmound at Ellis Landing.

[114] Moorehead, *l. c.*, p. 265.

In northern California obsidian is found near Mt. Shasta, on the north side of Mt. St. Helena and in pieces to the size of an ostrich egg in Napa Valley.[115] It is a product of volcanic eruptions, phenomena which were of frequent occurrence during the tertiary period. The material of which the implements found about the bay in all the shellmounds were made must have come from one of the above-named sources through trading. The small number of such implements found in the shellmounds is probably the result of the comparative rarity of the obsidian in this locality and the resulting care with which it was hoarded.

It is to be inferred that at no period was obsidian exclusively the material used for chipped stone implements, since workshop waste composed of materials found in the neighborhood has been discovered up to stratum II. Since, however, waste and no finished implements of local materials have been found above stratum V, the instances of the use of such must have been relatively isolated in the upper strata. Toward the lower strata, from about the VIIth but practically from the VIIIth on, there is a great increase in workshop waste. Stratum V is the uppermost one out of which one or two single objects (among them 1–8756, plate 6, fig. 21) may be considered finished implements. Of the thirty-nine implement-like objects obtained in excavating, only one is of unusual workmanship, an arrow-head of chert, 1–8815, plate 6, fig. 19, which comes from stratum VII, at the lowest part of cut C. The extraordinary accumulation of objects of chipped stone which can be termed implements begins with stratum VIII and continues down to the lowest stratum X. A considerable number of these is shown in plate 6. It is, however, remarkable that of these not one shows in its workmanship complete mastery in the handling of the material. The implement which, though still crude, shows the next best workmanship is the leaf-like point of crystalline rock, 1–8929, plate 6, fig. 20, from stratum VIII, found at the innermost end of the gallery.[116] All of the remaining implement-like objects of chipped stone bear the marks of crudity as do all of those that come from strata IX and X. It is

[115] Cf. Rau, Smiths. Rep., 1874, p. 358.

[116] It is similar in form to a point shown by Abbott, *l. c.*, p. 92, fig. 67, found in New Jersey, which he called a knife (p. 90).

very noticeable that because of this crudity in most of them, the line between implement and waste is very vague. It was therefore difficult to decide in the case of many objects whether they were to be regarded as tools at all. On the other hand, it is probable that a number of pieces included under rubbish may have really served as tools.[117]

Resulting from the discovery of obsidian, plate 10, fig. 15, chipped stones of good workmanship were found as far down as the upper part of stratum VIII. It is extremely doubtful whether they appeared at all in the strata below this. The objects made of material from the vicinity of the mound were certainly made during its settlement. A characteristic mark of the uniform crudity of all of these tools made of local materials and found in the lower strata is that they all are worked from but one side and that the elaboration of that side is accomplished by but a very few strokes. The only exception to this is the point, from stratum VII, pl. 6, fig. 19, which as to technique belongs in another place. Pl. 6, fig. 18, 1–9012, shows a ridge-like elevation on its lower side, thus forming an unimportant and superficial exception. The point, 1–8929, pl. 6. fig. 20, is also entirely even on its under side. In this they have a peculiarity characteristic of the well-known "turtle-backs."[118] This latter kind which in the eastern states of the United States has been found typical of the implements of the palaeolithic age is to be recognized in two objects in our collection, 1–9095, of green chert, pl. 6, fig. 2, from stratum X, and 1–9007 of a crystalline substance, pl. 6, fig. 1, from stratum IX. The first of these is without a doubt an implement, and the second is probably one. The palaeolithic turtle-backs of the East are unmistakably to be differentiated from the two objects under question in the material of which they are composed, which is argillite. In any case, however, the presence of these two objects proves that primordial species of stone implements existed into the neolithic period (for the mound rests on alluvial soil) and they may give ground for the estab-

[117] Comp. a similar remark in Abbott, *l. c.*, p. 93, concerning the doubtful nature of chipped stones as implements; from the stones in their vicinity they were conjectured to be implements.

[118] Cf. Abbott, *l. c.*, pp. 492 ff., and the same, Report of the Peabody Museum, 1876 to 1879, II, p. 33 ff.

lishing of the period from which such implements date, which is even farther back than that. The conical piece of jasper brought to a point by chipping, 1–8851, pl. 6, fig. 3, from stratum VII*a*, illustrates how implements were made by chipping from larger pieces of stone, and may even be itself a tool. It cannot be stated indisputably that the greater number of the common forms of chipped stones shown on pl. 6 were obsolete among the latter inhabitants of the mound. But it must be noted that the greater number and the most characteristic of them do not appear in the upper strata. We may surmise that as far as they did occur among the founders of the upper strata they had a better form. In addition to the pointed (pl. 6, figs. 19 to 20) and knife-like implements (fig. 21) the following important types are represented.

1. Long scrapers sharpened on one side, 1–9012, fig. 18, from stratum IX, and 1–9093, fig. 17, from stratum X.

2. Chisel-like tools terminating in front in a straight sharp edge. 1–8857, fig. 14, from stratum VII*a*, and 1–9080, fig. 15, from stratum X.

3. Scrapers, more or less rounded off or oval, 1–9023, fig. 8, from stratum IX, 1–9053, fig. 9, from stratum IX, 1–9085, fig. 10, from stratum X.[119]

In a like manner the following irregularly shaped objects might have been used as scrapers.

1–9043, fig. 7, from stratum IX.

1–8966, fig. 11, from stratum VIII or IX.

1–9012, fig. 12, from stratum IX.

1–9040, fig. 13, from stratum IX.[120]

4. Oval stones with high "turtle-back" backs with the encircling edges sharpened, probably too large for use as the usual scrapers:

1–9007, fig. 1, and 1–9095, fig. 2 .

5. Drills or awl-like, pointed stones, with a more or less thick base.

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[119] A hide-scraper fastened into a wooden shaft from the Thuswap Indians in British Columbia in the Jessup collection shown by Moorehead, *l. c.*, p. 255, fig. 388.

[120] Pictures of scrapers, see Abbott, *l. c.*, pp. 12 to 138.

1-8961, fig. 6, from stratum VIII or IX.

1-9005, fig. 5, from stratum IX.

1-9031, fig. 4, from stratum IX.

Instruments like the last have been found in many parts of the United States.[121] Several of these bear a great resemblance to those here shown, one such is pictured by Rau[122] from Santa Cruz Island, and one of like origin by Putnam,[123] one from Santa Rosa Island.[124] Traces of asphaltum found on the broad base of many similar ones would point to the fact of their once having been fastened to a shaft.[125]

B. Utensils of bone, horn, and the teeth of animals.

Implements of Bone.

Artifacts of animal derivation appear in great numbers and in a great variety of form among the objects recovered in excavating. This diversity in form is of course partly the result of the different kinds of bone used in their manufacture, partly of their varied manipulation, and partly of the uses to which they were put. There are all grades of elaboration from the most common splinter of bone to the tool whose shape is almost entirely different from that of the bone employed. All the objects found, however, may be reduced to the principal types of bone instruments which have been found in the United States under the most varying circumstances. In addition to awls, needles and paper-cutter-like knives of bone, there are instruments of horn used principally for chiseling and instruments of a secondary nature. They were the usual tools used in making clothes,[126] in weaving baskets,[127] etc., not to mention several subordinate uses to which they were put.

1. Awl-like tools.

This is a large class containing more than 100 objects having

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[121] Comp. Moorehead, *l. c.*, pp. 146, 170, 308; Abbott, *l. c.*, Chap. VII, pp. 97 to 119.

[122] Smiths. Contrib., *l. c.*, p. 90, fig. 318.

[123] F. W. Putnam, *l. c.*, p. 68, fig. 15.

[124] Moorehead, *l. c.*, p. 340, fig. 372, fig. 1.

[125] Rau, *l. c.*, p. 91, after P. Schumacher.

[126] Schoolcraft called them "moccasin-needles."

[127] The broom-binders of Mark Brandenburg to this day use bone awls, see Ranke, *l. c.*, II, p. 509.

various secondary forms and it is the most conspicuous class of bone instruments. They may be classified as follows:

a. Common awls with a good point.

These comprise more than 100 perfect and fragmentary specimens. They were scattered through almost all the strata in the following way:

Stratum I—8 objects.
Stratum II—61 objects.
Stratum III—8 objects.
Stratum IV—11 objects.
Stratum V—3 objects.
Stratum VI— — objects.
Stratum VII-VIII—5 objects.
Stratum IX—5 objects.
Stratum X—4 objects.

The remarkable preponderance in stratum II is probably again the result of the practice of cremation of bodies.

When one remembers that awls were the principal tools used in making baskets and that baskets took the place of pottery in the household of the California Indians, one will not wonder at their great number.

Their shapes vary. Four of them are shown in plate 9, figs. 1 to 4. Fig. 1, from stratum I, gives the type by far the most common in the 3 or 4 upper strata; the other three, fig. 2, 1–8686, from stratum IV, fig. 3, 1–8897, from VIII, fig. 4, 1–8972, from IX, give examples of the many secondary forms and illustrate the diversity of form occurring in the lower strata. Although fig. 4, as regards its shape, reminds us of the type of the tool of the upper strata (cf. fig. 1), not a single implement was found in the lower strata that was the exact counterpart of those in the upper. Manifestly it was the inhabitants of the upper strata who developed and established the latter form. Its distinctive feature is this, that only one side of the bone (mostly tibia of deer) is used, that a foot-like portion of the joint is left, and that the awl is sharpened and well finished off on all sides, even to the inner channel. Usually there is a slight bulging out in the middle of the tool which increases its strength.

The characteristic feature of pl. 9, fig. 2, is that only the shaft of the bone is open, the joint being left intact. In pl. 9, figs. 3

and 4, the foot-like supports are missing; whether originally they were there or not is a question. They seem to have been missing from the very beginning, at least the one shown in pl. 9, fig. 3. The whole shape of the instrument is crude. In several awl-like implements of the lower strata, as in text-fig. 25, 1–8797, from stratum VII, the canal in the bone is not even opened, but kept intact through the whole instrument.[128]

b. Blunt awl-like implements.

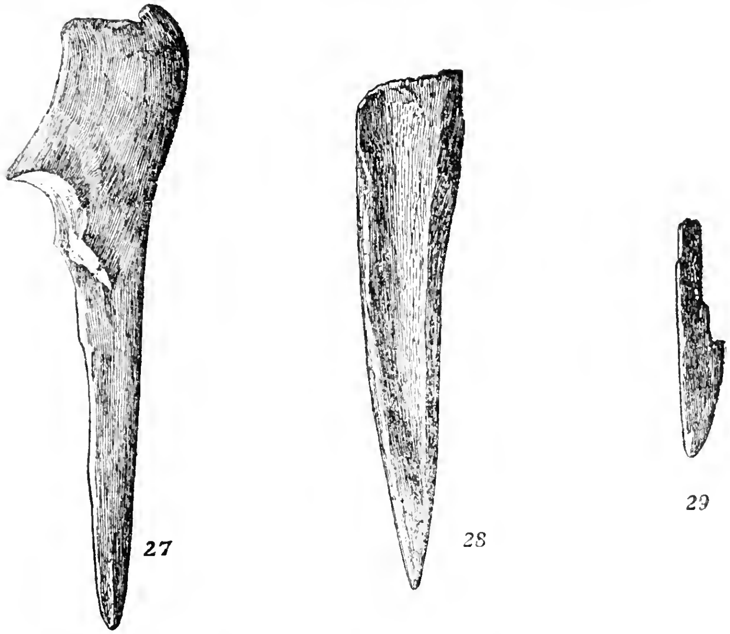
25

26

Fig. 25. × ½. A bone, probably used for an awl. Fig. 26. × ½. Bone implement of unknown use.

[128] Numbers of awl-like bone implements of this kind coming from the United States have been depicted. For those from California, see H. H. Bancroft, Native Races, IV, p. 711, No. 1 (the other so-called tool, No. 2, is a natural bone without value as a tool); Moorehead, *l. c.*, p. 271, fig. 410; F. W. Putnam, Rep. of U. S. Geogr. Survey, *l. c.*, pl. XI, figs. 13 to 15 and 19; p. 227, fig. 104; Nadaillac, *l. c.*, p. 49, fig. 15 (not very useful); from the southern states, for instance, Ch. C. Jones, Antiquities of the Southern Indians, 1873, pl. XVI, fig. 1; Moorehead, *l. c.*, p. 142; Chas. Rau, Smiths. Contrib., No. 287, p. 64, fig. 238 (Kentucky, Tennessee); from shellmounds of New England; Wyman, Am. Naturalist, I, pl. 14, fig. 5, and pl. 15, fig. 9 (both repeated in Abbott, *l. c.*, p. 213, figs. 199 and 202), from New York; Schoolcraft Archives of Aborig. Knowledge, 1860, II, pl. 49, fig. 3, with p. 90, from the Aleutian Islands, Chas. Rau, *l. c.*, fig. 236.

The absence of points indicates a somewhat different use to which such instruments were put. In addition to this feature there is very frequently a peculiar curve which, while it is the natural shape of the bone, must have been chosen purposely,—for instance, 1–8692, pl. 9, fig. 5, from IV, and 1–8829, text-fig. 26, from stratum VII*a*. The bone of front leg of a stag is the original form of the partly awl-shaped partly paper-cutter-like implement, 1–8579, text-fig. 27, from stratum II. A similar one from the southern part of the United States has been observed.[129]



Figs. 27 and 28. × ½. Bones probably used as awls. Fig. 29. × ½. Bone of "paper-cutter" type.

c. Flat Awl-like Implements.

These represent a large and important class of implements which occur in numbers in several of the lower strata (V and IX), although really only in fragments; cf. 1–8985, pl. 9, fig. 6, from stratum V. They are curved sideways, and well-pointed in spite of their otherwise flat character. The interior reticulate structure of the natural bone is retained on one side of the implement.

[129] Moorehead, *l. c.*, p. 142; comp. also Ch. Rau, Smiths. Contrib., No. 287, XXII, p. 64, fig. 237 (from Kentucky).

Fig. 28, 1–8541, from stratum II, has a peculiar shape; it is broad, in the form of a channel and pointed. One of the edges of the channel seems to be worn smooth through usage. The back end is broken off.

2. Needle-like Implements.

They differ from the awl-like implements in that they are intended not only to pierce an article but also to pass through it. In this class there are also secondary shapes.

a. Straight needles without perforation.

1–8895, pl. 9, fig. 8, found twenty-seven feet beneath the surface in stratum VIII, may be taken as the prevailing type. The needle is a thin, pointed instrument, oval in cross section, blunt at the back end, well finished throughout. To this class also belongs a number of fragments found in different strata up to the VIIIth.

b. Curved needles.

1–8901, pl. 9, fig. 9, from stratum VIII, represents this type. The needle is very slender and thin and of good workmanship. Unfortunately it is broken off at the smoth posterior end.[130]

c. Needles with "eyes."

We have also only one specimen of this type, 1–8735, pl. 9, fig. 10, from stratum V. It is straight, round in cross section and tapering at the perforated end.[131] The bluntness of the point must be the result of use.

d. Long crooked needles.

1–8831, pl. 9, fig. 7, a well preserved and seemingly perfect specimen, was found in stratum VII*a*, in the tunnel, from eleven to fourteen feet below the surface. It consists of a long, thin rib pointed at the stronger end, thereby exposing the canal within.[132]

[130] Comp. the objects found in a shellmound in New England, Am. Naturalist, I; pl. 15, fig. 17; it, however, is broader.

[131] A similar needle from a mound in Ohio has been shown by C. L. Metz and by F. W. Putnam, Rep. of the Peabody Museum, 1880 to 1886, III, p. 452. The Point Barrow Eskimos use a similar one (J. Murdock, IXth Ann. Rep. of the Bur. of Ethnology, 1887-88, p. 318, fig. 325).

[132] It reminds one somewhat (in that it is curved and pointed) of an instrument designated, and that manifestly wrongly, by Moorehead as a hairpin (see Moorehead, *l. c.*, p. 271, fig. 410, under No. 4). Jeanne Carr tells of needles made usually of the strong wing bones of the hawk, used to keep the strands in place when the basket-weaver left his work. These were handed down from mother to daughter generation after generation and regarded as valuable possessions. (The Californian, 1892, No. 5, p. 603.)

Among those found there is also a needle of fish bone and likewise one made from the spine of a stingray.

3. Rough awl-like implements of the lower strata.

We have chosen to discuss a number of implements from the lower strata under this separate head. Although some of these were probably used as awls, yet along with others with which they form a small group they cannot easily be considered with the other implements of this class. Plate 7, which represents typical bone implements of the lower layers, shows the greater number of these peculiar shapes in figs. 1 to 10. Altogether about fourteen of these awl-like implements were found in stratum VIII, five in stratum IX and four in stratum X. When one considers that from layers IX and X, only small sections were explored, the relative number of these implements must excite some interest. The awl-like and needle-like objects of pl. 9, although but little worked, are yet characterized by a definite fundamental form, different from that shown in the objects represented in pl. 7, figs. 1 to 10.[133] They represent simply bone splinters of the most varied forms such as would be made by accident. To be sure, there were isolated bone splinters in other places in the excavation, probably used as implements, as would naturally occur in a shellmound. In all of these latter cases, however, the character of the objects was, owing to the form of the bones and to the accidental or typical intention of their use, completely different. The objects shown in figs. 1 to 10 of this plate are made of fragments of somewhat thick long bones. All of them have been much used and the upper ends are strongly rounded and worn. Their use was evidently intentional both with reference to their more general and their typical uses. They do not belong to a peculiar type of implements because it is evident from their form that they were used for many purposes.

Some, as figs. 6, 7, and 8, 1–8919, 1–8918 (VIII), 1–8979 (IX), have an awl-like pointed form and may accordingly have been used as such an implement. Others, as figs. 1, 3, 4, and 10, 1–8983 (VIII), 1–9069 (X), 1–9068 (X), 1–9072 (X), although in general awl-like, are blunter and can hardly have been put to

[133] The principal smaller forms figured from southern California by Putnam, *l. c.*, Pl. IX, figs. 16-17.

the same use as these forms just mentioned. Objects like 1–8980, pl. 7, fig. 5; 1–8996, pl. 7, fig. 9, and possibly also 1–8871, pl. 7, fig. 2, have such broad and blunt ends that for them characterization as "awl-like" would be entirely unsuitable and their use must be explained in some other way. The tie that holds them together is, therefore, in no way that of similar use but rather of analogous origin. They comprise a large number of implements having different uses. What is common to them is the similarity of the way in which they were obtained. Their use was determined by the chance form which they thereby received. There is before us then a class of the most primitive ethnological implements of which we have knowledge, in which, as in the oldest known implement of the human period, the natural form of the object determines the use, rather than the use the individual form.

4. Implements of the shape of paper-cutters.

It is natural that in so large a number of bone implements this shape also should be represented. Five belonging to two different types have already been discussed under the grave finds. Altogether the amount of material of this character obtained from the upper strata of the mound is remarkably small. Only a small number of fragments were found, of which only a fragment of the point, 1–8803, from stratum VIII is represented in fig. 29.

In the deeper strata the case was entirely different. There are from these layers no perfect implements, only fragments, but their number is in proportion to what one would expect, or even greater. Some of these show a variety of form and a degree of ornamentation which was hardly to be expected among the finds of the mound in general and least of all among the specimens obtained from the lower strata. Little as the well formed implements, which the fragments figured in pl. 7, figs. 11-17, represent, appear to resemble the rough awl-like implements on the same plate and which have been derived from the same strata, there is yet no doubt possible that the two classes of implements must have been used by the same people.

We have therefore the task, instead of denying the contrast, of suggesting some solution for it.

These paper-cutter like implements have a moderate width and a thickness of only one-thirty-second to one-sixteenth of an inch. They are well worked in all cases. The objects shown in fig. 12, 1–8989 (IX), fig. 14, 1–8987 (IX), fig. 15, 1–8920 (VIII), fig. 13, 1–8988 (IX), of plate 7 show artistic forms differing from the simpler types of implements. Perforation, which in the bone implements of the mound is very infrequent, is in these implements alone found four times on the lower end. The notch on the lower end of pl. 7, fig. 14, probably the remnant of a circular section, is very artistic and one notices also curved lines on the surface about it. These show the geometric accuracy with which this work was carried out. 1–8986, pl. 7, fig. 16, from stratum IX, is the only piece of bone among all those recovered from the mound which has been engraved with geometric figures.

Out of the strongly varying yet constantly artistic characters of these fragments we are justified in drawing the conclusion that a much greater variety of implements of this form was used by these people. The variations seem to have been influenced largely by personal taste.

1–8875, fig. 11, represents a small fine point of a well formed small paper-cutter-like implement.

1–8989, fig. 12, stratum IX, is a quadrate piece of bone cut out of a "paper-cutter" and was possibly used in play.

1–8988, fig. 13, stratum IX, is the lower end of a "paper-cutter" with parallel sides and obliquely truncated at the lower end with a remarkably perfect perforation.

1–8987, fig. 14, stratum IX, is the lower part of a thin "paper-cutter" with a semi-circular notch. The base shows broken surfaces next the notch.

1–8920, fig. 15, stratum VIII, the lower, triangular part of a "paper-cutter," which has been very broad and thin, has a small perforation.

1–8986, fig. 16, stratum IX, the middle fragment of a well-worked "paper-cutter" ornamented with geometric figures.

1–8984, fig. 17, stratum IX, is the oblong upper part of a very thin, well-worked "paper-cutter" with a perforation. The upper part is broken off.

At this place there should probably be mentioned also the

small bar of bone, 1–8975, fig. 18, stratum IX, as it also comes from this stratum. This is likewise an uncommon form of implement. It is small and well worked, although not of the paper-cutter type. It is oval in cross section and has a small paper-cutter-like lower end which shows that it was fastened to some other object. Its upper end is broken.

5. Pointed Implements.

In the middle strata of the mound there were found about eight pointed bones, of which the types are figured in pl. 9, figs. 11–16.

1–8869, pl. 9, fig. 11, stratum VII, is $2\frac{1}{8}$ inches long, oval in cross section and having an inferiorly constricted neck. There is a small hook on the lower end of the broad side. A small fracture on the opposite side appears to indicate that there were originally two such hooks.

1–8868, fig. 12, stratum VIII, is two inches long. This specimen is in general similar to the one just mentioned. There is only one hook at the lower end. The side opposite is without a hook and is unbroken. Similar is 1–8738, from stratum V. An analogous object is figured by Moorehead, page 273, fig. 412, No. 3, from Stockton Channel.

1–8916, fig. 13, stratum VIII, 2 inches long, is similar to the last with the differences that the small broad, flat hook points toward the broad side, and that the pointed end has been smoothed by use. On this end there are also small traces of asphaltum which indicate that a cord had sometime been wound about it to fasten it to some other object.

1–8917, fig. 14, stratum VII*a* or VIII, $1\frac{7}{16}$ inches long with a rounded cross section, is slightly curved and gradually narrows towards the lower point. The convex side shows a slight flattening.

1–8870, fig. 15, stratum VII*a* or VIII, is $1\frac{1}{2}$ inches long, but the lower end is incomplete. The cross section is oval to flat; it shows on the broad side a sloping groove.

1–8694, fig. 16, stratum IV, an implement $2\frac{3}{16}$ inches long, is typically knife-like in its form in so far as it has a broad blade-like part. It is sharp on one side, blunt on the other and rounded at the upper end. It is bent well backward. At the lower end it

runs out into a small neck-like portion which is extended in the same line with the back of the implement and is broadened at the base.

The objects already described and shown in figs. 11, 13, 14, 15, and 16 of plate 9 represent the principal types. Among these the knife-like object, fig. 16, is, judging from its shape, evidently to be separated from the others.[134] Numerous other knives of obsidian occur in addition to this one of bone.

Of the remaining, fig. 14 represents a typical arrow point made of bone such as are used in various parts of the world, *e.g.*, in South America. The convex, slightly flattened side was laid against the slightly truncated upper end of the shaft of the arrow and was fastened to it by numerous coils of cord. The figure of a similar arrow point from the Swiss Pile Dwellings is given in Ranke's work, Vol. II, pp. 5–19. fig. 11. This shows very well the manner of attachment.

The similarity of the remaining bone points, figs. 11, 13, 14, 15, is so significant that a similar use is to be ascribed to them. That they were used as fishhooks, which might be conjectured, there appears to be less evidence. It is worth considering that Mr. Meredith found on the breast of a single skeleton 51 objects of the form shown in pl. 9, fig. 14. In another case 28 such objects were found.[135] In the first case, with the skeleton in addition to these were found two long spear spoints with barbs such as are used on the northwest coast of America. A large number of objects from one grave and the association with other analogous objects supports very strongly the idea that the pointed bones were used for the points of arrows. The neck of these points was the portion about which the cord was wound and about this was laid a small quantity of asphaltum to hold the cord in place, while the hooks had the object of preventing the cord from sliding off from the neck. The form of the hooks varies but slightly. This suggests the prominent hooks at the base of the

[134] Compare knife-like "hide-scrapers" of bone used by the Eskimo of Behring Straits and figured by E. W. Nelson in the 18th Annual Report of the Bureau of Ethnology, 1896-97, Part I, pl. 50, figs. 3-6.

[135] In Moorehead, *l. c.*, p. 272. Two similar objects from South America are figured by F. W. Putnam, *l. c.*, pl. 11, figs. 10, 11, and are described (p. 227) as fishhooks.

arrow points of stone. In a certain way these arrow points may possibly be considered as a middle form between long bone points provided with barbs, such as were used by the Eskimo, and the Indian arrow points of stone. In this connection it is worth noting that Mr. Meredith finds them in association with such bone points (also with a lip-plug such as are used on the northwest coast of America). The form of the Indian stone arrow-heads might have been imitated in the North in other materials.

That the analogy with the more northerly races is not limited to the burial layers of the mound from which the pointed implements, pl. 9, figs. 11, 15, were found is indicated by the object, pl. 7, fig. 12, which was found in the cremation layer, No. 2.

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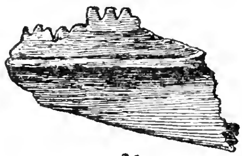

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Figs. 30 and 31. × ½. Notched bones perhaps used in net-making or weaving.

6. Saw-like notched bones.

The excavations furnish twelve objects of this type of implement, of which perhaps half were from stratum II. The remainder were found from the lower strata up to the eighth. Quite a number of the objects from stratum II were calcined, an evidence that they were deemed of value in life since they were burned with the dead.

The best preserved type of this implement, of which in most cases only small fragments were found, is shown in 1–8898, pl. 9, fig. 17, stratum VIII.

Nearly all of these objects have a stereotyped form, being made from the shoulder blade of some large mammal, probably the deer. One, however, seems to have been made from a bird bone (1–8900, fig. 30, stratum VIII). On the specimen shown in pl. 9, fig. 17, about half of the length is taken up by the rounded handle, using the ridge-like end of the bone for this purpose. The other end of the object is incomplete, but according to the

form in other specimens it was probably cut off squarely at the end. At any rate only a small piece of the implement is missing since the teeth cut into the thin convex margin of the bone are complete to the number of 15. The ridge-like edge runs next to the row of teeth, giving the implement greater firmness. The teeth vary considerably in different objects in size, in form, and in regularity (compare 1–8573, fig. 31, from stratum II). They also vary in degree of wear, which so far as observed is sometimes seen on the edge and sometimes in the spaces between the teeth. On one specimen the opposite edges of the bone are similarly toothed, although one side of the bone was quite thick. A smoothing or polishing of the object is never to be noticed, excepting on the under side.

Similar objects have frequently been found in California. Single fragments are figured by Moorehead.[136] As similar as these objects are to saws, it is probable that they were not used as such. The name "sachos" given to these implements by the Napa Indians, who possibly did not know their former use, is not to be taken as the slightest support for the idea that they were actual saws. In the first place it is hardly necessary to mention that the concept "saw" is missing among the Indians. The form of these objects and the general state of wear as already described shows that they were not and could not have been used as saws. It is remarkable enough that saw-like implements made of bone have a distribution much more extended than the Californian region. Since these occurrences are mostly local and entirely independent of each other, these implements must in their production have served certain practical aims. Why, however, saws made of bone should have such a wide distribution it is difficult to understand.

An analogous implement has been found in a shellmound in Massachusetts and figured by J. Wyman. He also in his description has shown that judging from the width of this implement it could not have been used as a saw.[138]

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[136] Moorehead, *l. c.*, p. 236, fig. 363.

[138] The stone points with saw-like teeth on the edge do not represent technically such an implement as a saw since the toothing is only a result of the method of reproduction.

Another saw-like toothed bone implement was found in the cave dwellings in Franconia (Bavaria), which were inhabited in the early neolithic period. This has been described by Ranke as probably used in weaving.[139]

An implement having almost identical form as this just described above was figured by J. Murdock. This object was obtained from the Pt. Barrow Eskimo and was made of the shoulder blade of a reindeer. He received it as a model of a saw said to have been used before the introduction of iron.

After having made inquiries for the primitive form of the implement, this specimen doubtless was made for him.[140] His paper also contains a figure of another saw-like implement, of about twice the size of the first, made of antler. There was with this a kind of shuttle and a form of weaver's sword with the statement that these three implements had been used in weaving feather girdles. In watching the process of making these belts he had, however, not seen any of these three implements.[141] In the opinion of the writer there is no reason to doubt materially the accuracy of the statements concerning the use of these implements by the Eskimo. It therefore contains the key to the understanding of all the remaining forms of this type of saw-like implements found in the northern region. And this explanation may be extended to the wrongly determined Californian bone saws. In our opinion the bone implement first figured by J. Murdock shows simply that the Eskimo remembered having had such an implement and that they gave to him the impression that it had been used in the way in which the investigator was inclined to think it ought to have been used. It appears that Ranke was on the right track when he supposed the Frankish bone implement to have been used in some processes of weaving. In like manner all of the Californian bone saws agree thoroughly with this supposed use.[142] In California many valuable feather girdles have been made, in the weaving of which these bone implements may

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[139] Am. Naturalist, 1868, Vol. 1, pl. 15, fig. 15, 583.

[140] Der Mensch, II, p. 558-560.

[141] Ninth Annual Report of the Bureau of Ethnology, 1887-88, p. 175, fig. 147.

[142] *l. c.*, p. 317, fig. 323.

have been used.[143] The exact mode of their use is not yet determined, but it is to be hoped, however, that even this may some time or other be discovered.

7. Various Implements and Objects of Bone.

It naturally occurs that in a shellmound in which so many implements of bone have been preserved there would be a number of bone objects the use of which can only be imperfectly determined. These implements are in part possibly only attempts to work bone, in part they are actually implements which had a use somewhat different from that of the other forms and a use for which the character of the material especially fitted them.

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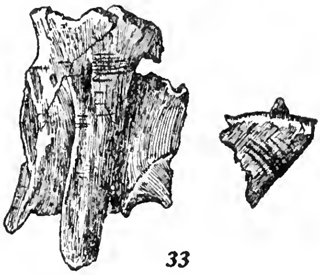

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Figs. 32 and 33. × ½. Bone artifacts of unknown use.

Many fragments of bone show only a few cuts or marks as indications that they were worked. In one case, 1–8527, fig. 32, stratum IX, the marks which vary somewhat from those in the other strata may represent an implement of the paper-cutter type. The point is in this case calcined, as is also true of many other implements. This is evidently done intentionally, possibly in order to work the bone more easily. Other common bone fragments look as if they had occasionally been used as implements when they happened to have the right form, and that they were not intentionally worked into this shape. Still other bone fragments show knife-like incisions on the other edges, as, for ex-

[143] Recently a great deal has been written about the relation of widely separated peoples to each other. And this relationship has usually followed definite geographic lines. It is, however, worth while to notice the great similarity between the implements of eastern and western United States, and those of the caves of Switzerland and of the Arctic region. Many implements of similar type and use are to be found in these regions, implements which are not discovered in any other portion of the world.

ample, that shown in fig. 33, 1–8877, stratum VII*a*. They are probably not to be considered as marks of dog's teeth, as which these could also be determined, for they are generally very numerous in one place or else they show exceeding regularity as if made intentionally.

The shellmound dwellers did not fail to notice the peculiar character of the tubular bones, which when cut into sections are easily made into small receptacles, similar to the cane plant, which is used in a similar manner by the inhabitants of tropical regions (for instance by the ancient Peruvians). Many such small objects with differing proportions were found, two of which are shown in fig. 34, 1–8922, stratum VIII; and fig. 35, 1–9076, stratum X.

Implements of Antler.

For many kinds of implements antler is particularly valuable on account of its hardness. For this reason a number of implements of this character have been found in the shellmound; they are, however, not so numerous as those of bone. They are usually made of deer or elk antler.

1. Chisel-like Implements.

Of these there are two principal types.

a. Actual chisels.

About half of the objects of antler are to be considered as complete implements. These are shown in pl. 8, figs. 2*a* and 2*b*, 1–8892, stratum VIII; figs. 3*a* and 3*b*, 1–8821, from stratum VII*a*, represent the two subspecies of the same, *viz.*, broad and narrow chisels. The main difference between the two is simply one of size and proportion.

The broad chisels are represented by about ten objects, which belong to the middle and lower strata of the mound only, down to the Xth stratum. Whether this is accidental or caused by other reasons remains undecided. These objects are from four and one-half to five and one-half inches long, to one and three-fourths inches broad, and even as thick as one and one-quarter inches. Oval in cross section, they slightly diminish toward the lower end. Frequently they pass one to two inches above the lower end into the flat, knife-like, one-sided slope, ending in a semi-circular edge about one inch broad. The sloping surface as

well as the polished sides of the implement frequently have impressions due to actual use upon hard objects. In a similar manner, the straight surface is broken by the use of a hammer which was struck upon it.

The narrow chisels are represented only by one complete specimen (pl. 8, fig. 3) and two fragments of the knife-edge. The latter were found between strata VII*a* and IX. The complete chisel is only three and nine-sixteenths inches long; while it is one and three-sixteenths inches broad at the upper end, and but seven-sixteenths of an inch thick, it nevertheless diminishes toward the lower end to a breadth of three-eighths of an inch at the knife-edge. The slope of the one side toward the latter is by far shorter than that of the broad chisel, and yet the same indications of its use with a hammer can be found. The curvature of the cross section of this implement corresponds to the natural form of the antler from which it was made.

Such chisels[144] partly took the place of an axe in woodwork among the Indians, just as, for example, this was still the case among the Hupa during the eighties of the last century,[145] in the construction of houses. The Klamaths in Oregon still make use of such chisels. The better known implements of recent times possess only the natural surface of the original antler.

It is of interest to know that implements of exactly the same kind were found in the shellmounds of the Atlantic coast, *e.g.*, in Maine.[146]

b. Chisel-like Implements of varying forms.

Implement 1–8730, pl. 8, fig. 1, found in stratum V, has a length of nine and three-fourths inches and a breadth of one and seven-eighths and one and five-sixteenth inches. It will be seen that though of greater length and breadth it is flatter than the preceding. On account of its origin from a complete antler it is curved along its length, and slightly curved in on its concave side. At the lower end of the latter it is given a straight slant

[144] A little information on this point is brought together by the writer in Mitth. der Anthrop. Ges. Wien., 1886, Vol. 16.

[145] A similar one from San Joaquin county has been illustrated by Moorehead, *l. c.*, p. 271, fig. 410, No. 2. Cf. also F. W. Putnam, *l. c.*, p. 229, figs. 106-108, wedge-like implements from southern California.

[146] Cf. Mason, Smithson. Reports, 1886, I, pl. xviii, fig. 19, with 10, 208.

for three and a quarter inches in the diameter of the breadth. Its upper end shows the same signs of use with a hammer, while the slanting surface is greatly worn on the sides. This makes it probable that the use of this tool was in many respects different from the preceding. It was possibly used as a lever.

For this also a parallel exists in the form of an apparently identical implement from the shellmounds in Maine.[147] As regards form, certain implements of the bones of cattle found in the caves of French Switzerland are similar to this object. Rauch calls them "leather-cutters" (Lederschneidemesser).[148]

2. Implements of antlers with dull, rounded ends.

Three such objects have been found. One of them is seven and one-eighth inches long, diminishing, horn-like, toward the blunt point. It came from the middle stratum of the mound. It is represented in pl. 8, fig. 7. Another is a young branch of an antler, and the third is a mere fragment. The use of these objects, which were doubtless implements, cannot be conjectured.

3. Pointed Implements.

Only one fragmentary blade exists, about one inch long.

4. Straight, truncated Implements.

Two specimens of this kind came from stratum V of the mound. They are wanting in other parts of the mound. One of them is reproduced in pl. 8, fig. 4. It diminishes, horn-like, toward the lower end. Here it is truncated abruptly, having a breadth of five-eighths inches. Unfortunately the upper end is incomplete. The other implement, 1–8722, is absolutely identical with the one just described.

The collection contains also a fragmentary bone tool, 1–9066, which was found in stratum X. It may have corresponded to the peculiar implement, reproduced by J. Wyman,[149] pl. 14, fig. 3 (with the spiral cuts at the upper end), which was found in the shellmounds of Massachusetts.

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[147] Cf. J. Wyman, *l. c.*, pl. IV, figs. 2 and 2*a* with p. 583. Ch. A. Abbott, who represents the same implement, *l. c.*, p. 211, fig. 196, says Massachusetts probably by mistake.

[148] J. Wyman, *l. c.*, pl. XIV, fig. 1, with p. 582. Cf. also Ch. A. Abbott, *l. c.*, p. 211, fig. 195. The implement is unfortunately represented in both places sidewise in an unfavorable manner.

[149] *l. c.*, II, p. 556.

Implements of Tooth.

Only one object made of tooth was found, *viz.*, 1–8736, fig. 36, in stratum V. It is a bear's tooth perforated at the root, serving the purpose of ornament or amulet, and corresponds exactly to the typical illustration of the one from New Jersey:[150] here Abbott emphasizes the fact that such ornaments were the most common among the earlier and present-day Indians.

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Figs. 34 and 35. × ½. Fragments of bones. Fig. 36. × ½. A bear-tooth ornament.

C. Implements made of shells.

The objects of this material mentioned among the grave-finds are supplemented by two implements, one of which came from the IInd, the other from the VIIIth stratum of the mound. Both are made of the haliotis shell, the material preferred for ornamental purposes by the Indians throughout the country. Recovered in different strata, they differ completely with respect to their form. Yet, owing to the scarcity of the finds we are not permitted to advance the opinion that the form of one was limited in its stratum to the complete exclusion of the other.

1–8632, fig. 37, from stratum II, is about as long as broad, but rounded off at the lower part, while the upper rim is cut off straight. The three-sixteenths inch wide perforations in one row on the upper rim served for the purpose of suspending.

[150] Cf. F. W. Putnam, *l. c.*, pl. XI, fig. 18.

1-9106, fig. 38, from stratum VIII, represents the broken edge of a larger ornamental plate which was originally triangular or of a quadrilateral shape. The edge is now trapezoidal. Two of the four sides still show the well-worked rims, ornamented with

37 38

Fig. 37. × ½. Fig. 38. × ⅘. Haliotis shell ornaments.

indentations, of the original ornamental plate. The two other sides are rough surfaces of fracture.[151]

[151] Ch. A. Abbott, *l. c.*, p. 406, fig. 388.

Issued June 15, 1907.

EXPLANATION OF PLATE 2.

Emeryville Shellmound seen from the Bay. The cut made in the side of the mound had been filled when the photograph was taken, but the site of the excavation is seen in the light area on the western slope.

EXPLANATION OF PLATE 3.

Topographic map of the Emeryville Shellmound. Contour intervals 5 feet. Scale: 1 inch = 60 feet.

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EXPLANATION OF PLATE 4.

Fig. 1. Cross-section of the western foot of Emeryville Shellmound, showing the extent of the excavations. Scale: 1 inch = 19.4 feet.

1. Alluvial clay.

2. Thin gravel layer.

3. Basement clay, the stratum upon which the mound and the gravel layer rest.

Fig. 2. Cross-section through the principal excavated portion of the western foot of the Emeryville Shellmound, illustrating the stratification of the deposits. Scale: 1 inch = 6.46 feet.

I-X, Recognized strata of the mound.

A, B, C. Sections of the excavation designated in text.

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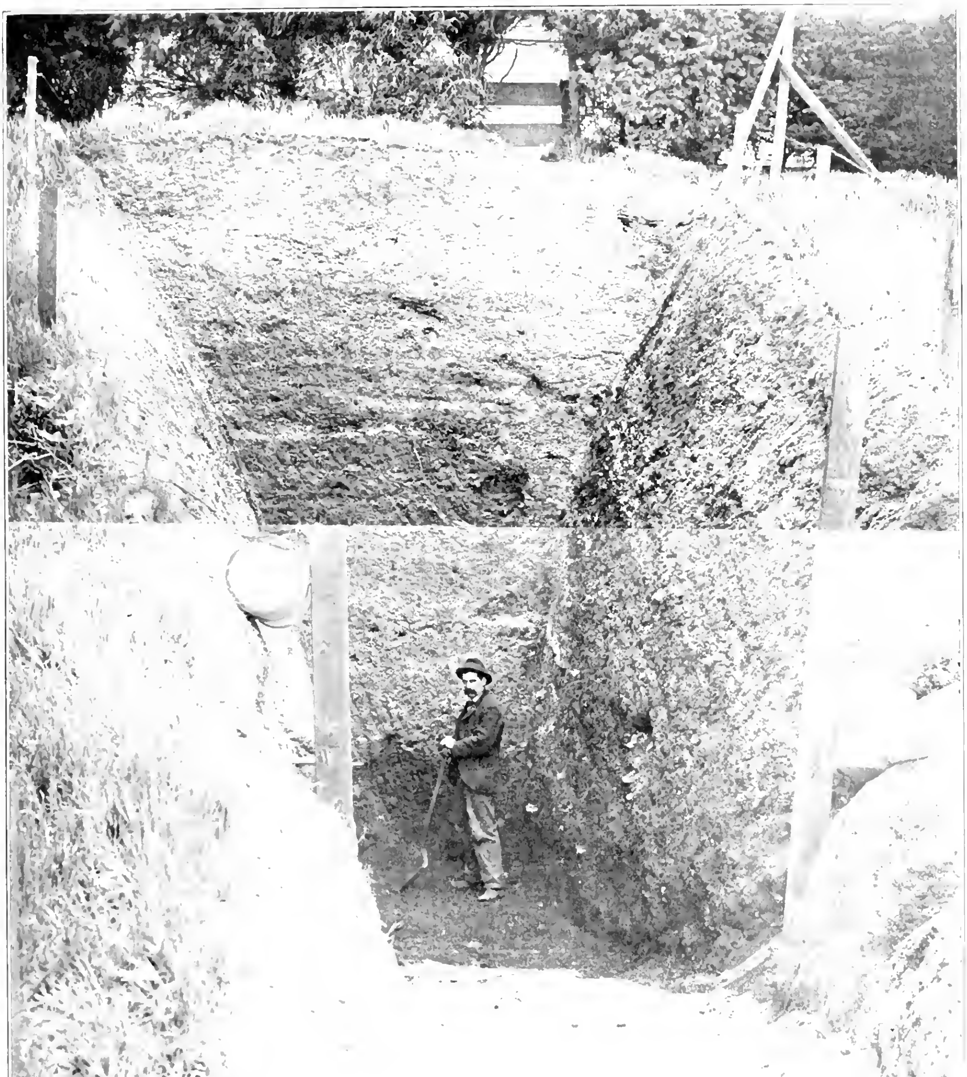
EXPLANATION OF PLATE 5.

The open cut on the western side of the Emeryville Shellmound.

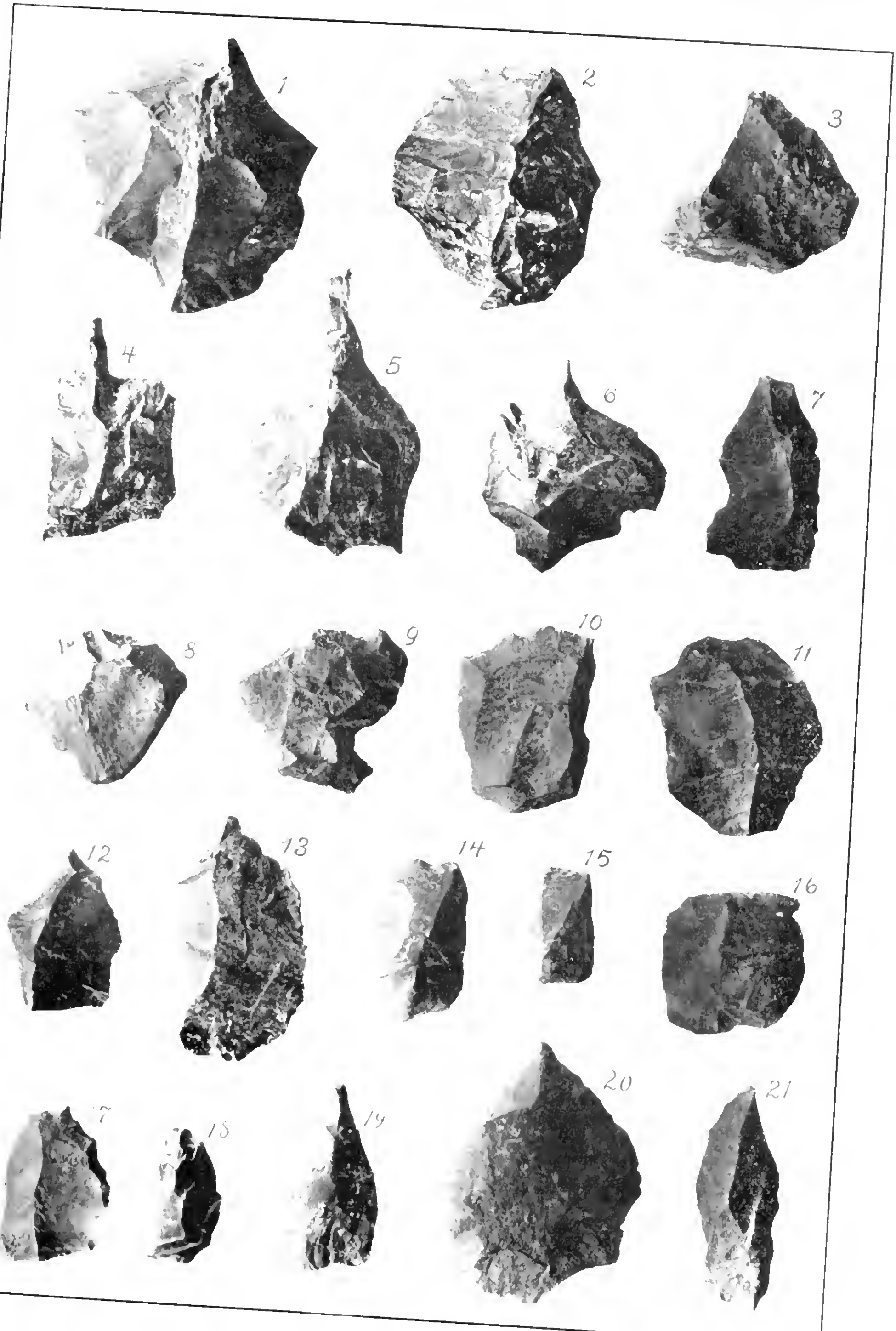


EXPLANATION OF PLATE 6.

Figs. 1-21. Flaked cherts principally from the lower layers of the mound. Some of these, as represented by figs. 4, 5, 6, 11, 19, and 20, are possibly finished implements. The others are perhaps in part rejects, but all were probably used to some extent. $\times$ 6/10.

Following are the accession numbers of the specimens, as catalogued in the museum of the Department of Anthropology.

Fig. 1 (1–9007)	Fig. 11 (1–8966)
Fig. 2 (1–9095)	Fig. 12 (1–9012)
Fig. 3 (1–8551)	Fig. 13 (1–9040)
Fig. 4 (1–9031)	Fig. 14 (1–8857)
Fig. 5 (1–9005)	Fig. 16 (1–?)
Fig. 6 (1–8961)	Fig. 17 (1–9093)
Fig. 7 (1–9043)	Fig. 18 (1–9012)
Fig. 8 (1–9023)	Fig. 19 (1–8815)
Fig. 9 (1–9053)	Fig. 20 (1–8929)
Fig. 10 (1–9085)	Fig. 21 (1–8756)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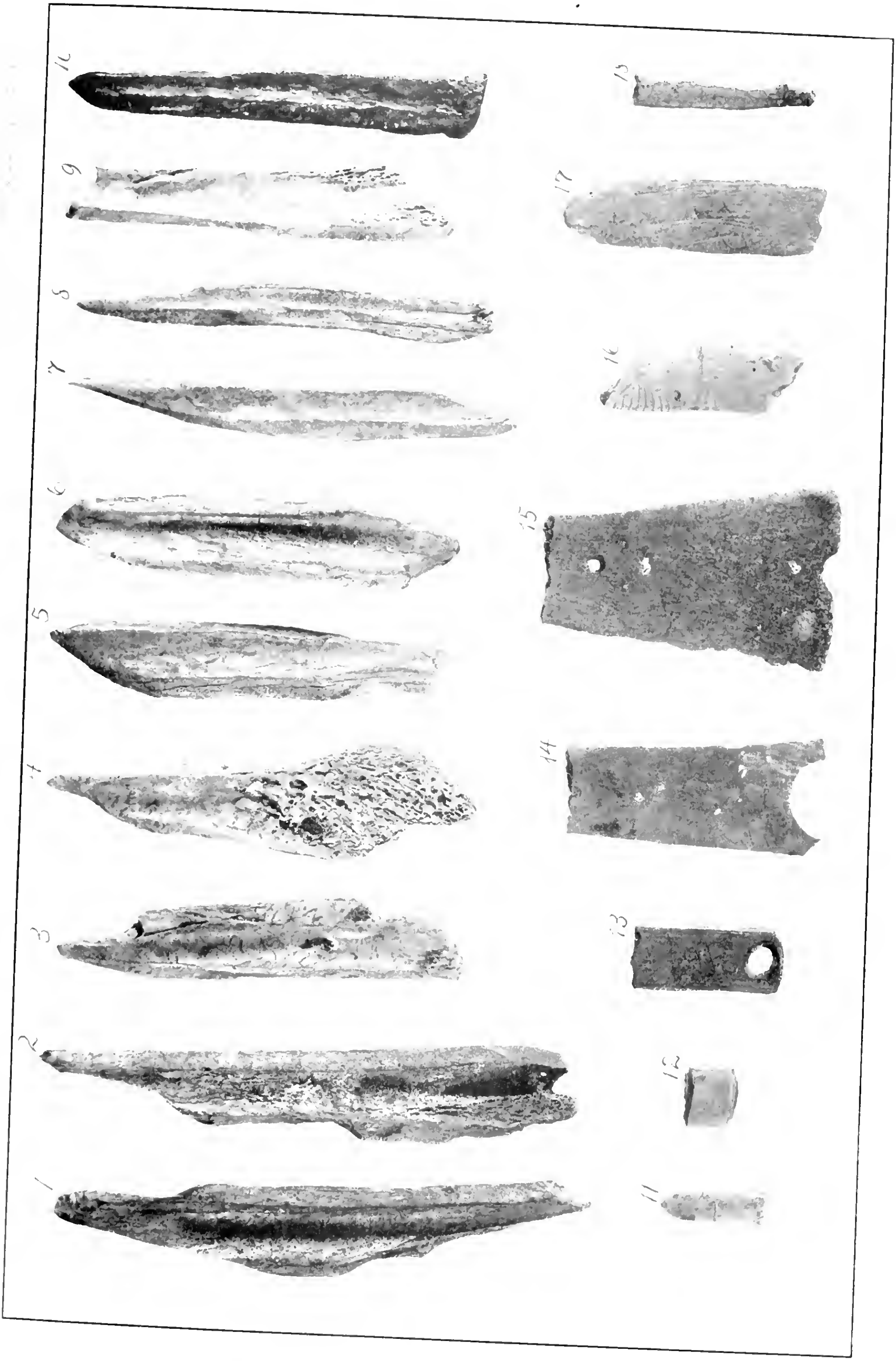
EXPLANATION OF PLATE 7.

Rough bone implements and ornaments largely from the lower layers of the mound. × ⅔.

Fig. 1 (1-8983)	Fig. 10 (1-9072)
Fig. 2 (1-8871)	Fig. 11 (1-8875)
Fig. 3 (1-9067)	Fig. 12 (1-8989)
Fig. 4 (1-9068)	Fig. 13 (1-8988)
Fig. 5 (1-8980)	Fig. 14 (1-8987)
Fig. 6 (1-8919)	Fig. 15 (1-8920)
Fig. 7 (1-8918)	Fig. 16 (1-8986)
Fig. 8 (1-8979)	Fig. 17 (1-8984)
Fig. 9 (1-8996)	Fig. 18 (1-8975)



EXPLANATION OF PLATE 8.

Implements of bone and antler from the Emeryville mound. Figures about one-half natural size.

Fig. 1 (1–8730)

Figs. 2*a* and 2*b* (1–8892)

Figs. 3*a* and 3*b* (1–8821)

Fig. 4 (1–?)

Fig. 5 (1–8780)

Fig. 6 (1–8778)

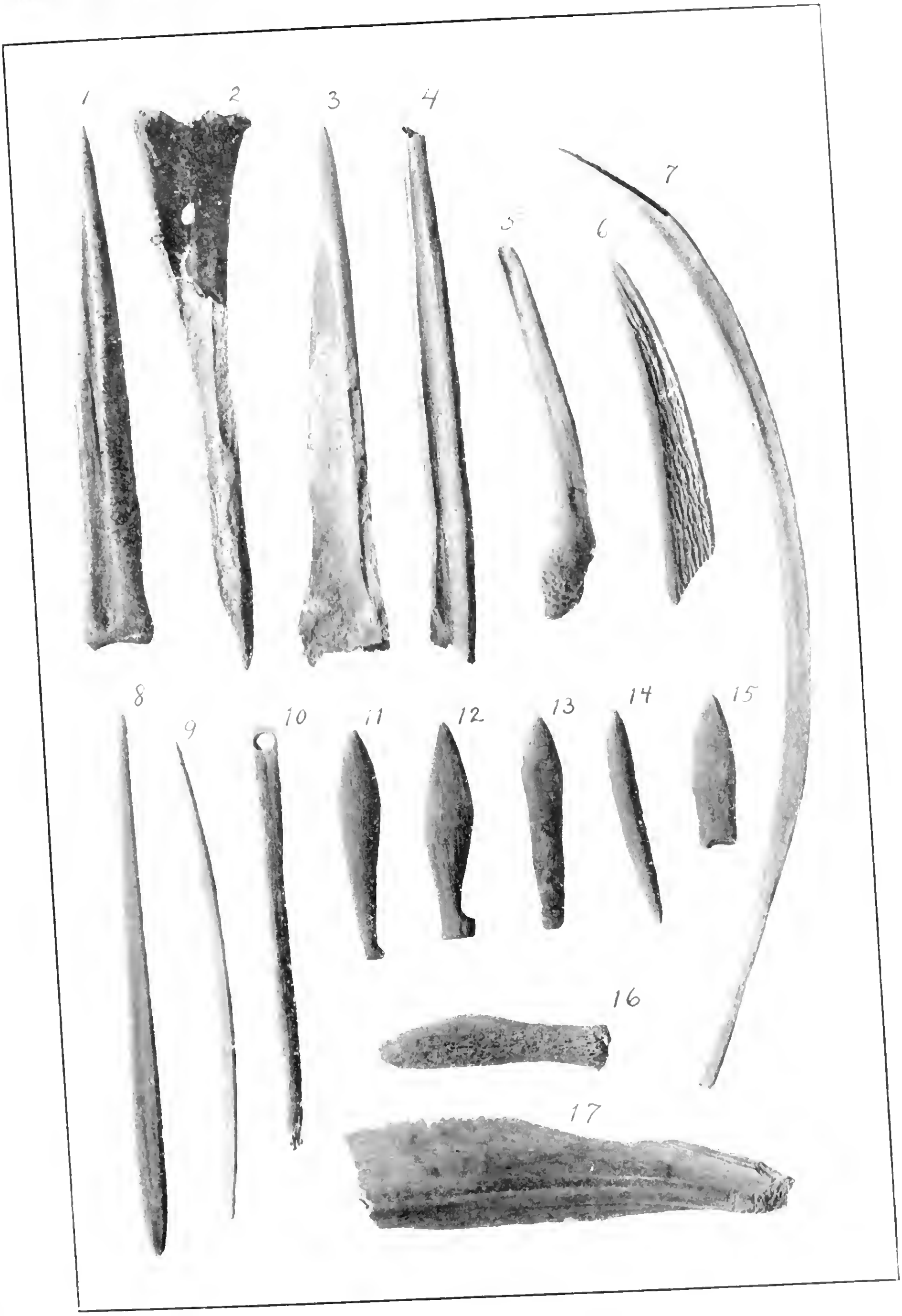
Fig. 7 (1–8889)


1
2a
2b
3a
3b
4
5
6
7

EXPLANATION OF PLATE 9.

Bone implements from the Emeryville mound. $\times \frac{6}{10}$.

Fig. 1 (1-8522)	Fig. 10 (1-8735)
Fig. 2 (1-8686)	Fig. 11 (1-8869)
Fig. 3 (1-8897)	Fig. 12 (1-8868)
Fig. 4 (1-8972)	Fig. 13 (1-8916)
Fig. 5 (1-8692)	Fig. 14 (1-8917)
Fig. 6 (1-8985)	Fig. 15 (1-8870)
Fig. 7 (1-8831)	Fig. 16 (1-8694)
Fig. 8 (1-8895)	Fig. 17 (1-8898)
Fig. 9 (1-8901)	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16
17

EXPLANATION OF PLATE 10.

Stone implements principally from the upper layers of the mound. Figures about three-fifths natural size.

Fig. 1 (1–8613)	Fig. 9 (1–8925)
Fig. 2 (1–8611)	Fig. 10 (1–8610)
Fig. 3 (1–8615)	Fig. 11 (1–8633)
Fig. 4 (1–8718)	Fig. 12 (1–8536)
Fig. 5 (1–8614)	Fig. 13 (1–8676)
Fig. 6 (1–8618)	Fig. 14 (1–8883)
Fig. 7 (1–8719)	Fig. 15 (1–8926)
Fig. 8 (1–8616)	Fig. 16 (1–8634)


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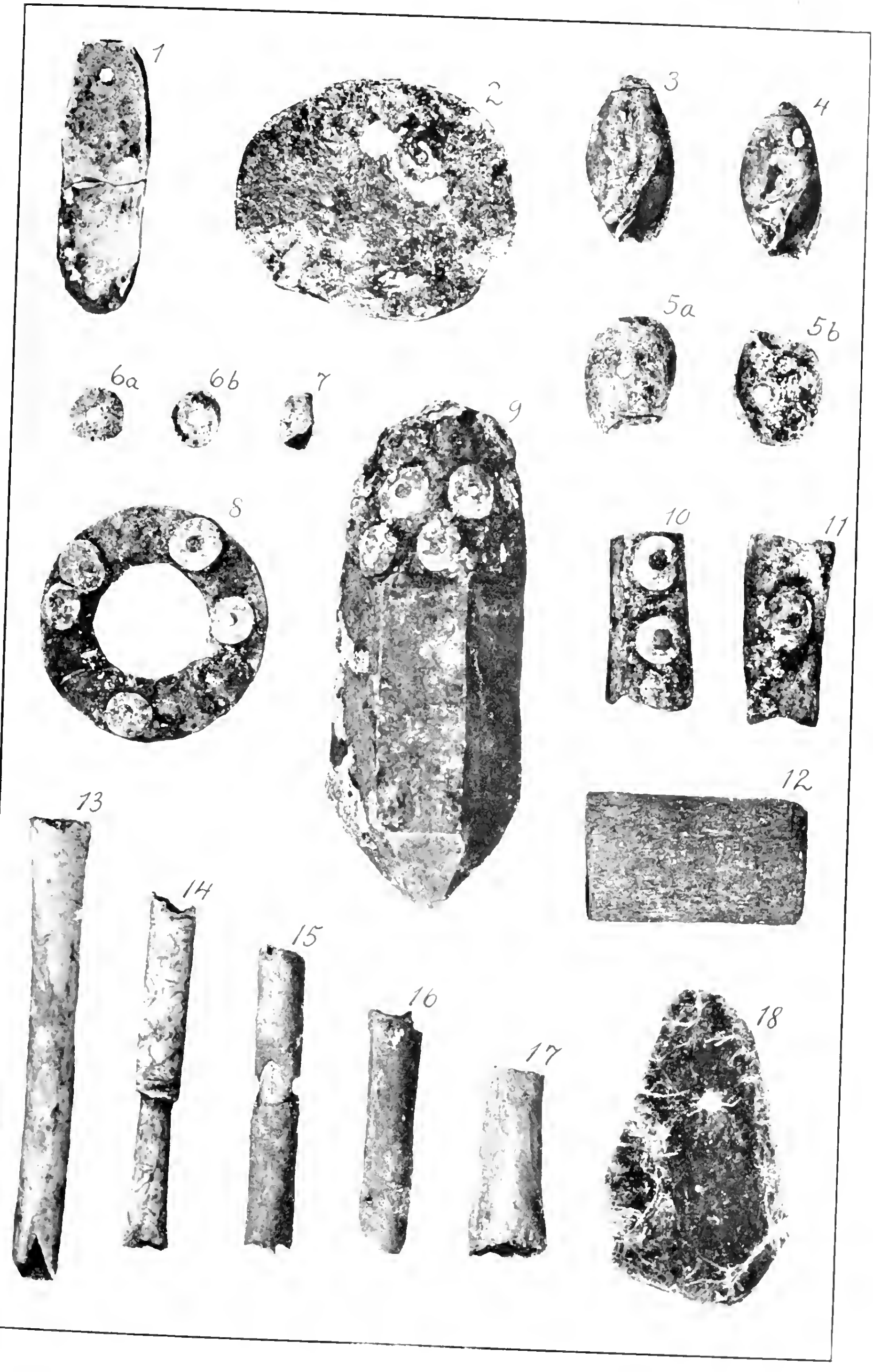
16

EXPLANATION OF PLATE 11.

Ornaments principally from the upper and middle layers of the mound. Natural size.

Fig. 1 (1-8777)	Fig. 9 (1-8791)
Fig. 2 (1-8784)	Fig. 10 (1-?)
Fig. 3 (1-8879)	Fig. 11 (1-?)
Fig. 4 (1-8775)	Fig. 12 (1-8843)
Figs. *5a* and *5b* (1-?)	Fig. 13 (1-8702)
Figs. *6a* and *6b* (1-8788)	Fig. 14 (7-8743)
Fig. 7 (1-?)	Figs. 15, 16, and 17 (1-8776)
Fig. 8 (1-8783)	Fig. 18 (1-8766)


1
2
3
4
5a
5b
6a
6b
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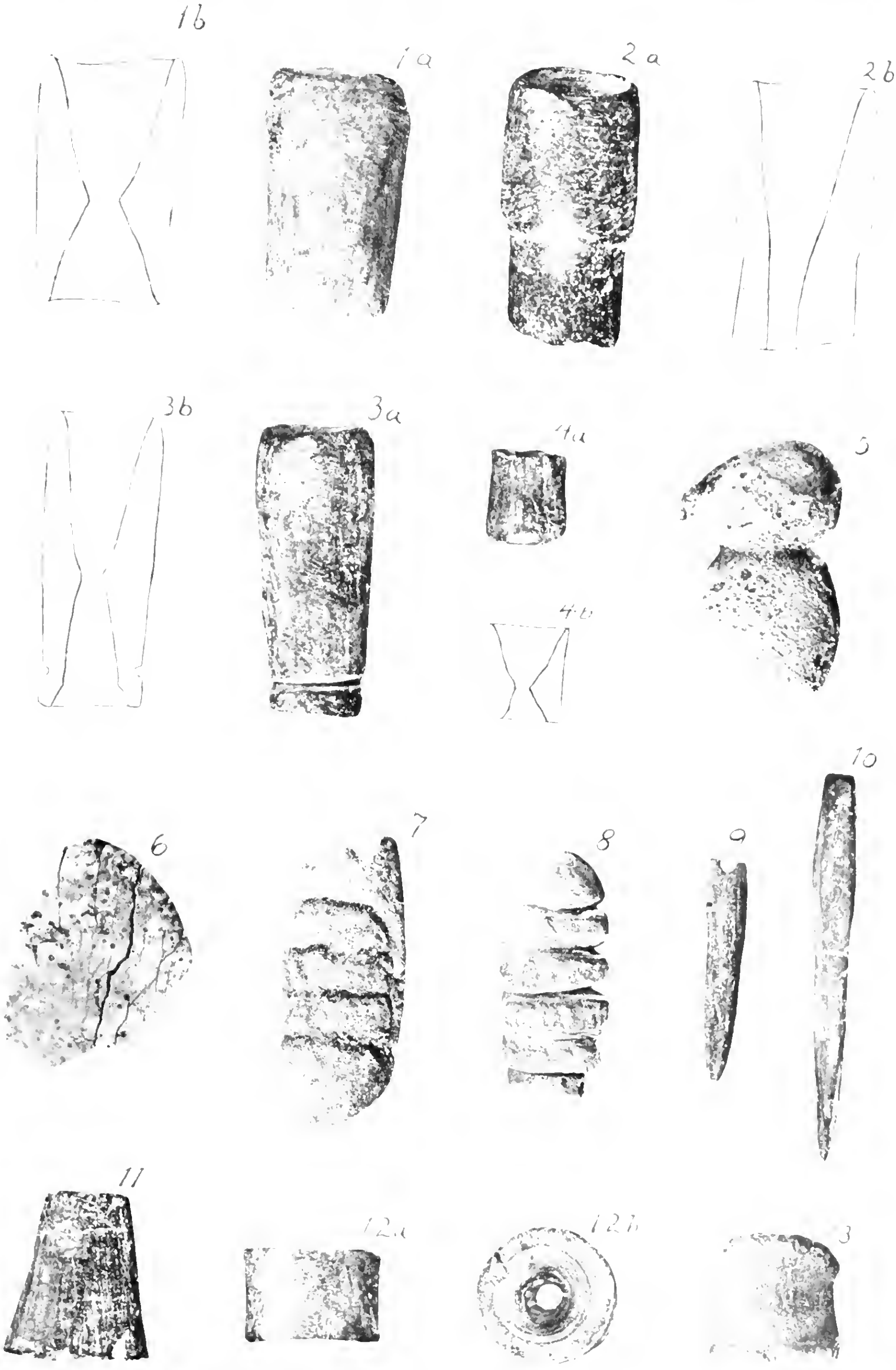
EXPLANATION OF PLATE 12.

Various artifacts principally from the upper layers of the mound. Figures 1 to 4, $\times \frac{3}{4}$; figures 5 to 13, $\times \frac{2}{3}$.

Figs. 1*a* and 1*b* (1–8624)
Figs. 2*a* and 2*b* (1–8622)
Figs. 3*a* and 3*b* (1–8623)
Figs. 4*a* and 4*b* (1–8626)
Fig. 5 (1–8850)
Fig. 6 (1–8631)
Fig. 7 (1–8535)
Fig. 8 (1–8630)
Fig. 9 (1–8711)
Fig. 10 (1–8608)
Fig. 11 (1–8620)
Figs. 12*a* and 12*b* (1–8671)
Fig. 13 (1–8628)


1b
1a
2a
2b
3b
3a
4a
4b
10
6
7
8
11
12a
12b

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IN
AMERICAN ARCHAEOLOGY AND ETHNOLOGY

Vol. 7 No. 2

RECENT INVESTIGATIONS BEARING ON THE QUESTION OF THE OCCURRENCE OF NEOCENE MAN IN THE AURIFEROUS GRAVELS OF THE SIERRA NEVADA

BY
WM. J. SINCLAIR

BERKELEY
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FEBRUARY, 1908

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CONTENTS

Introduction.

The question of the early existence of man in California, and of the occurrence of his remains in the gold-bearing gravels beneath the lava flows on the western slope of the Sierra Nevada, originated from the work of the Geological Survey of California under Professor J. D. Whitney. A large part of the evidence on which the affirmative view is based is presented in Whitney's memoir on the auriferous gravels.[1] Several writers have contributed to the discussion since the publication of that work, but a comparatively small amount of geological evidence has been presented either for or against specific instances of man's occurrence in these deposits.

In working on the general problem of the time of man's appearance in the Californian region, the Department of Anthropology of the University of California has taken up, as a necessary part of the investigation, a review of the evidence relating to the so-called auriferous gravel relics. The writer was commissioned to visit the localities where the discoveries of human remains reported by Whitney and others were made, and to compare the geological conditions found there with such intrinsic evidence as is presented by the artifacts and bones preserved. Several months were spent during the summer of 1902 in studying the various occurrences of auriferous gravels in Tuolumne, Calaveras, and Eldorado counties, which comprise the majority of the classic localities where human remains are said to have been discovered. Though the results of the writer's work are largely of a negative character, it is considered advisable to present them as a portion of the general report on the studies on the antiquity of man in this region now being carried on by the department.

The excellent maps of the United States Geological Survey render any general discussion of the distribution and stratigraphy of the gold-bearing gravels unnecessary. As pointed out by Lindgren,[2] the gravels mapped as Neocene by the survey, on the

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[1] The Auriferous Gravels of the Sierra Nevada of California. Mem. Harvard Mus. Comp. Zool. Vol. VI, 1880.

[2] U. S. Geol. Atlas, Colfax Folio, Descriptive Text.

atlas sheets of the California gold belt, are of several quite distinct ages with reference to the rhyolitic and andesitic lava flows. "The auriferous gravels proper may be divided into (1) the deep gravels, (2) the bench gravels, (3) the gravels of the rhyolitic epoch, (4) the gravels of the intervolcanic erosion epoch, (5) the gravels of the andesitic tuff." The bench gravels "often contain a predominating amount of quartz pebbles, but no andesite or rhyolite." Those of the intervolcanic erosion epoch "contain pebbles of the Bed-rock series and of andesite and rhyolite."[3] To these may be added a sixth division, the post-andesitic stream gravels which contain pebbles of the Bed-rock series and of all the lavas—rhyolite, andesite, and latite.

It is to be noted that Whitney, while recognizing that the gravels described by him differed in age and in their relation to the intercalated volcanic flows, made no attempt to specify from which gravel the human remains reported by him were obtained, grouping all under the general term auriferous gravels. Some such division of the gravels as that proposed by Lindgren must be kept in mind in the treatment of the question of man's occurrence in these deposits. The lithological characters of the gravels are important in a discussion of the rock types represented in the various implements reported from them.

In examining the region the writer studied the majority of the classic localities mentioned by Whitney and others. Little could be gained by attempting an investigation of all the localities, as in most cases the description is given in such general terms that an identification of the exact localities is impossible. This is particularly applicable to regions of hydraulic mining.

Evidence Favoring the Occurrence of Human Remains in the Gravels.

The evidence favoring the occurrence of man in the auriferous gravels may be subdivided into three classes: (1) human remains reported from hydraulic mines; (2) human remains found in place in undisturbed gravel; (3) human remains from drift mines.

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[3] Lindgren, loc. cit.

Human Remains from Hydraulic Mines.—Various stone relics are said by Whitney to have been found in placer mines in different parts of the gravel region. Several of these implements are said to have been associated with bones of the mastodon and other extinct vertebrates. Most of them were found at considerable depths and in one or more instances are said to have been covered by a deposit of calcareous tufa several feet thick.

Human Remains in Place in Undisturbed Gravel.—A broken pestle was found by Clarence King, the geologist, in 1869, in place in a gravel bank exposed by a recent wash, close beneath the latite cap of Table Mountain in Tuolumne County. The implement was firmly imbedded and when dislodged left the impression of its shape in the gravel matrix.

Human Remains from Drift Mines.—There is a large amount of evidence based on the reported occurrence of human remains in the gravels buried beneath the basaltic, andesitic, and rhyolitic lava flows. These gravels are reached by vertical shafts and by horizontal and inclined tunnels termed drifts. The published evidence consists of statements and affidavits by persons who were either operating the mines and made the discoveries, or who were more or less cognizant of the facts in the case at the time when the relics were found. The relics recovered and preserved consist of stone implements and human bones. To one of the latter finds, the so-called Calaveras skull, great interest attaches because the bone has lost its organic material and has taken on the appearance of a true fossil. It has been claimed that the matrix investing the skull is of the same character as the gravel of the mine where the specimen was found.

Review of the Evidence in Detail.

The vast majority of occurrences reported from placer mines can no longer be verified. In addition to the confusion arising from lack of classification as to age of beds involved, Professor W. H. Holmes[4] has shown that there is a strong probability that a large proportion, if not all, of the stone implements reported

[4] Review of the Evidence Relating to Auriferous Gravel Man in California. Am. Anthropologist Jan. and Oct., 1899; Smithsonian Rept. for 1899, pp. 419-472, Plates 1-16, Washington, 1901.

from gravels worked by the hydraulic method have fallen into the mine from recent Indian village sites situated on bluffs above the mine pits, owing to the recession of the gravel bank under the attack of the hydraulic giant. There should also be kept in mind the possibility of accidental burial in the flood plain of a recent stream working over gravels of all ages. Wood's Creek near Jamestown may be taken as an example, from which Whitney reports implements at depths of from twenty to forty feet.

Human Remains from Gold Springs, Kinkaid Flat, and Shaw's Flat.—Whitney reports a number of implements from these localities. Of these, the following from the Voy collection preserved in the museum of the University of California may be mentioned:

(*a*) Original No. 12[5] Voy coll. (1–4205.)* A mortar with diagonal groovings said to have been found in 1863, "near other relics and animal remains imbedded in auriferous gravel mixed with calcareous tufa, at a depth of about sixteen feet beneath the surface" in the vicinity of Gold Springs. The material of this mortar is a pinkish hornblende andesite.

(*b*) Orig. No. 13[6] Voy coll. (1–4197.) An oval dish or mealing stone of hornblende andesite, said to have been found in 1862 in Gold Spring Gulch, Tuolumne County, "in auriferous gravel beneath an accumulation of about twenty feet of calcareous tufa."

(*c*) Orig. No. 16 Voy coll. (1–4204AB.) A mortar and pestle said to have been found in 1863, associated with other stone relics and bones of the mastodon, etc., in auriferous gravel about sixteen feet below the surface, in Gold Springs Gulch. The mortar is of hornblende andesite.

(*d*) Orig. No. 10 Voy coll.† A mortar of diorite porphyry said to have been found at Shaw's Flat in 1863, in auriferous gravel about fourteen feet below the surface.

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[5] Referred to by Whitney, Aurif. Grav. p. 263, figured by Holmes, loc. cit. Am. Anth. Pl. VI.

* The numbers in parentheses are the catalogue numbers of the Museum of the Department of Anthropology of the University of California. The original Voy numbers have been employed in this paper since they have already been cited by other authors.

[6] Referred to by Whitney, Aurif. Grav. p. 263, figured by Holmes, loc. cit. Am. Anth. Pl. VI.

† This specimen has not been located in the Museum.

(*e*) Orig. No. 9[7] Voy coll. (1–4208AB.) A mortar of pinkish hornblende andesite, and a pestle of amphibolite schist, said to have been found in 1861 in auriferous gravel at a depth of sixteen feet, at Kincaid Flat.

The gravels at Springfield and Columbia, which are also given as localities affording human remains, are similar to those at Gold Springs, Shaw's Flat, and Kincaid Flat, and one description will apply to all. Usually they are not well-worn stream-washed pebbles like those characterizing the Neocene channels, but subangular fragments largely of vein quartz or quartzite. The underlying Carboniferous lime-stone has been eroded into fantastic shapes by percolating waters during or after the deposition of the auriferous wash. The mammalian fauna listed by Whitney from these localities (mastodon, elephant, bison, and the horse *E. occidentalis*) indicates a Pleistocene age for at least a part of the deposit, although some of it is certainly older. In a limestone region with underground drainage, it is quite apparent that implements of human manufacture which happened to be scattered on the surface would stand an excellent chance of reaching deeper levels through the many sink holes affording drainage ways to surface waters. That this is true for some of the animal remains is shown by Leidy's[8] identification of teeth of the recent horse from depths of twenty-five and twenty-nine feet in the gravels at Kincaid Flat. Before mining was begun, these flats were covered with a growth of oaks and were probably advantageous village sites.

The calcareous tufas on the Grant ranch at Gold Springs are all of Pleistocene or recent origin. They have been deposited by large springs, one of which has at present a steady discharge of fifty miner's inches. The tufa deposit conforms to the drainage slopes possessed by the present topography. It is sometimes fine and powdery, but may assume a radiate crystalline and a shelly facies. Intercalated with and underlying the tufa are shallow deposits of subangular gravels which have been worked for gold. These gravels appear to have been formed by the waters from the

[7] Referred to by Whitney, Aurif. Grav. p. 263, figured by Holmes, loc. cit. Am. Anth. Pl. VI.

[8] Aurif. Grav. p. 257.

same springs which deposited the tufas. There is no available means for determining the rate of accumulation of these deposits. The springs have shifted their points of discharge since the tufas were formed and are not now depositing this substance at a rapid rate. It is of course impossible to determine the nature of the association of the implements with these tufas and gravels, or to locate the place where they were found. The only available information is that conveyed by Whitney and by the labels on Voy's collection. It is known however that Voy obtained his specimens from this locality at second hand, from persons who probably claimed to have found them as described.

The implements from these localities afford no inherent evidence of antiquity. They are of the same type and material as those found on old Indian sites.

Human Relics from Murphys.—The detrital material filling crevices in the limestone in the vicinity of Murphys is also a reputed source of human relics. While some of this material is Pleistocene, other portions are recent and some of it may antedate the Pleistocene. In the absence of detailed information regarding the exact localities where the implements were found, these occurrences may be passed without further comment.

The King Pestle.—The only account of the occurrence of human relics in the gravels which has gone practically unchallenged is that published by Dr. Becker[9] regarding the discovery by Clarence King of a broken pestle in the andesitic gravels and sands close beneath the latite cliff of Table Mountain. The locality is given as that part of the mountain lying a couple of miles southwest of Tuttletown. This would be above Rawhide. The implement was dislodged from hard gravel, leaving behind a cast of its shape in the matrix. The relic is a portion of a pestle of fine grained diabase, the end highly polished by wear in the hand. As a geologist, Mr. King was a reliable observer and able to determine whether or not the implement was in place and formed an integral part of the mass of gravel in which it was imbedded. Secondary cementation does not seem to have been taken into consideration. On many of the outcrops of andesitic sandstone in the vicinity of this locality, secondary cementation is

[9] Bull. Geol. Soc. Am. Vol. 2, p. 193.

in progress, indurating the soft sands into a hard rock to the depth of at least an inch. It is unfortunate that the matrix containing the impression of this relic was not preserved. As it is, there is no way of confirming the discovery. We have nothing but the specimen and the published account to work from. An examination of the locality yielded little of value in this connection. Immediately beneath the latite are coarse andesitic breccias with an occasional water-worn pebble. Farther down are gravels and sands. Holmes[10] reports finding "Digger" mealing stones scattered over the slope.

Human Relics from the Table Mountain Drift Mines.—The following occurrences of human implements and bones in the gravels pierced by deep tunnels extending beneath Table Mountain are mentioned by Whitney:

(*a*) A human jaw and a stone muller in the collection of Dr. Snell. Both objects are said to have been taken from under Table Mountain. The exact localities are not stated. Both have probably been, long since, lost or destroyed.

(*b*) A fragment of a human skull from the Valentine shaft on the Columbia claim, a little south of Shaw's Flat. Portions of this specimen were given to the museums of the Boston Natural History Society and the Philadelphia Academy of Natural Science. The specimen is said to have come from a depth of one hundred and eighty feet, from beneath a series of strata comprising in descending order surface soil, pipe clay, "cement" with leaf impressions and gravel. It was taken from the sluice in which gravel from the mine was being washed. In addition to the bone, a mortar is said to have been found in these workings in the gravel.

(*c*) A white marble bead from the Sonora tunnel. The specimen was taken from a carload of gravel coming out of the tunnel. When found it is said to have been incrusted with pyrite.

(*d*) A mortar from the Boston tunnel, found by Llewellyn Pierce.

(*e*) A human skeleton from a tunnel under Table Mountain. No further particulars are given.

(*f*) A perforated cutting implement and several stone mor-

[10] Loc. cit. Am. Anth., p. 622.

tars from the Stanislaus Co.'s claim at O'Byrns' Ferry, Tuolumne Co. The relics were found "from sixty to seventy-five feet from the surface in gravel, under the basalt and about 300 feet in from the mouth of the tunnel."

For several of these occurrences there are absolutely no data on which to base an investigation, nor any attendant circumstances to establish their validity as evidence. The relics in the Snell collection are lost. No particulars are furnished regarding the skeleton. The implements from O'Byrns' Ferry have not been preserved. The geological features of the locality are essentially the same as those of the more northerly parts of Table Mountain.

The position of the Valentine shaft was sought by the writer, but without success. Regarding the possibility of an external origin for the objects reported from this shaft, Whitney says: "The essential facts are, that the Valentine shaft was vertical, that it was boarded up to the top, so that nothing could have fallen in from the surface during the working under ground, which was carried on in the gravel channel exclusively, after the shaft had been sunk." In this connection it may be pointed out that many of the old drift mines south of Shaw's Flat were connected and that this system of galleries was ventilated by air shafts, so that the possibilities are not limited to one shaft, however securely that one may have been boarded.

The Sonora tunnel is an incline starting in andesitic sands and pipe clay beneath the latite near the intersection of the roads to Tuttletown and to Sonora via Shaw's Flat. It is said to connect with some of the deeper workings under Table Mountain. Little dependence, as an evidence of antiquity, can be placed on the presence of pyrite in the hollow of the marble bead reported by Whitney from the gravels of this mine. The rapidity with which secondary pyrite forms is well known. Calcium carbonate might act as a precipitating agent in salts of iron dissolved in the mine water.

The relics from the Valentine shaft and Sonora tunnel were not found in place in undisturbed gravel, but were taken in one case from the sluice in which gravel was being washed, and in the other from gravel brought out in the car. If this degree of

association with the gravel is to be accepted as proof of antiquity, we would be justified in supposing that any object of recent manufacture acquired under similar circumstances was as old as the gravels. Neither of these occurrences can be accepted as a valid proof of the antiquity of man.

Perhaps more importance has been attached to the mortar vouched for by Llewellyn Pierce, than to any of the preceding. The evidence for the antiquity of this relic is presented by Whitney in the following affidavit:[11]

Sonora, Tuolumne County, California,
December 28th, 1870.

"This is to certify that I, the undersigned, have this day given to Mr. C. D. Voy, to be preserved in his collection of ancient stone relics, a certain stone mortar, which has evidently been made by human hands, which was dug up by me, about the year 1862, under Table Mountain, in gravel, at a depth of about 200 feet from the surface, under the basalt, which was over sixty feet deep, and about 1,800 feet in from the mouth of the tunnel. Found in the claim known as the Boston Tunnel Company. In these claims at various times there have also been found numerous bones of different animals."

(Signed) Llewellyn Pierce.

The label accompanying this specimen, which is No. 6[12] of Voy's coll. (1–4209), places the depth from the surface at 340 feet, 140 feet of which is said to have been basalt.

Mr. Pierce, who resides about a mile above Jeffersonville, Tuolumne Co., was interviewed by the writer. During the course of this interview the following information was furnished by Mr. Pierce. The mortar from the Boston claim was as large as a sixteen-gallon milk bucket and would weigh about seventy-five pounds. It was found in hard gravel under the cement, and was taken out by Mr. Pierce while he was sitting on a candle box, breasting out gravel. The writer was shown a small oval tablet of dark colored slate with a melon and leaf carved in bas-relief. Mr. Pierce claimed to have found this in the same gravels as the mortar, and, he thought, probably at the same time. This tablet

[11] Aurif. Grav. p. 266.

[12] Figured by Holmes, loc. cit. Am. Anth., Pl. VII.

shows no signs of wear by gravel. The scratches are all recent defacements. The carving shows very evident traces of a steel knife blade and was conceived and executed by an artist of considerable ability. The mortar preserved in Voy's collection is an oval boulder of hornblende andesite into which a hole has been worked, about four and three-quarters inches in greatest width, and three and three-quarters inches deep, dimensions to which those of a sixteen-gallon bucket must be regarded as rather a liberal approximation. The deep gravels in the bottom of the Table Mountain channels, tapped by the Boston Tunnel and other workings, are largely inaccessible, but so far as known are not volcanic.[13] The incongruity of associating an andesitic mortar and a tablet engraved by steel tools, with the old prevolcanic gravels is at once apparent. The andesitic sands and gravels of Table Mountain lie above the auriferous channel gravels in which these relics were supposed to occur.

The Neale Discoveries.—Considerable information has been gathered by Becker[14] and Holmes[15] regarding the reported discovery of implements by Mr. J. H. Neale of Sonora, in the Montezuma Mine. It is desired here to compare these published statements with the story as told to the writer by Mr. Neale, and with the testimony of the locality. It will be necessary to quote at some length from the paper referred to. The affidavit published by Dr. Becker is as follows:

Sonora, August 2, 1890.

"In 1877 Mr. J. H. Neale was superintendent of the Montezuma Tunnel Company, and ran the Montezuma tunnel into the gravel underlying the lava of Table Mountain, Tuolumne County. The mouth of the tunnel is near the road which leads in a southerly direction from the Rawhide Camp, and about three miles from that place. The mouth is approximately 1,200 feet from the present edge of the solid lava cap of the mountain. The course of the tunnel is a little north of east. At a distance of between 1400 and 1500 feet from the mouth of the tunnel, or of between 200 and 300 feet beyond the edge of the solid lava, Mr. Neale saw

[13] Turner and Ransome, Sonora Folio. Explanatory text.

[14] Becker. Bull. Geol. Soc. Am. Vol. 2, p. 191.

[15] Holmes. Smithsonian Rept. for 1899, p. 450.

several spear-heads, of some dark rock and nearly one foot in length. On exploring further, he himself found a small mortar three or four inches in diameter and of irregular shape. This was discovered within a foot or two of the spear-heads. He then found a large well-formed pestle, now the property of Dr. R. I. Bromley, and near by a large and very regular mortar, also at present the property of Dr. Bromley.

"All of these relics were found the same afternoon, and were within a few feet of one another and close to the bed-rock, perhaps within a foot of it.

"Mr. Neale declares it utterly impossible that these relics can have reached the position in which they were found excepting at the time the gravel was deposited, and before the lava cap formed. There was not the slightest trace of any disturbance of the mass or of any natural fissure into it by which access could have been obtained either there or in the neighborhood.

"And Mr. J. H. Neale declares upon his oath that the foregoing statement is in every respect true."

(Signed) John H. Neale.

With this should be compared the statement published by Holmes:

"One of the miners coming out to lunch at noon brought with him to the superintendent's office a stone mortar and a broken pestle which he said had been dug up in the deepest part of the tunnel, some 1500 feet from the mouth of the mine. Mr. Neale advised him on returning to work to look out for other utensils in the same place, and agreeable to his expectations two others were secured, a small ovoid mortar, 5 or 6 inches in diameter, and a flattish mortar or dish, 7 or 8 inches in diameter. These have since been lost to sight. On another occasion a lot of obsidian blades, or spear-heads, eleven in number and averaging 10 inches in length, were brought to him by workmen from the mine. They had been found in what Mr. Neale called a 'side channel,' that is, the bed of a branch of the main Tertiary stream about a thousand feet in from the mouth of the tunnel, and 200 or 300 feet vertically from the surface of the mountain slope. These measurements were given as estimates only, but at the same time they

were, he felt sure, not far wrong. Four or five of the specimens he gave to Mr. C. D. Voy, the collector. The others also had been given away but all trace of them had been lost. Mr. Neale spoke enthusiastically of the size and perfection of these implements, and as he spoke drew outlines of long notched blades in the dust at our feet. Some had one notch, some had two notches, and others were plain leaf-shaped blades.''

''Desiring to find out more concerning these objects, he went on to say, he showed them to the Indians who chanced to be present, but, strangely enough, they expressed great fear of them, refusing to touch them or even speak about them; but finally, when asked whether they had any idea whence they came, said they had seen such implements far away in the mountains, but declined to speak of the place further or to undertake to procure others.''

The following statements by Mr. Neale regarding the discovery of these implements were taken down by the writer in the course of the interview: A certain miner (Joe), working on the day shift in the Montezuma tunnel, brought out a stone dish or platter about two inches thick. Joe was advised to look for more in the same place. At the time, they were working in caving ground. Mr. Neale went on the night shift and in excavating to set a timber, 'hooked up' one of the obsidian spear points. With the exception of the one brought out by Joe, all the implements were found personally by Mr. Neale, at one time, in a space about six feet in diameter on the shore of the channel. The implements were in gravel close to the bed-rock and were mixed with a substance like charcoal.

The large pestle and mortar mentioned by Becker are in the United States National Museum. The material of the mortar is andesite.

The geological conditions in the vicinity of the Montezuma mine are similar to those at other points along Table Mountain. The detrital deposits beneath the latite are not well exposed, but wherever seen are found to be andesitic breccias, gravels, sands, and pipe clay. The deep gravels lying in the center of the channel are believed to be prevolcanic, so that there is involved the anomaly of two late volcanic rock types, andesite and obsidian, occurring in the prevolcanic gravels.

The mouth of the Montezuma tunnel lies below the road leading south from Rawhide and as well as can be ascertained by rough measurements is about thirteen hundred and ninety feet from the base of the latite cliff, measured along the irregularities of the slope from the cliff to the mine. According to some accounts, it was intended as a drainage tunnel for the placer mines at Montezuma on the other side of the mountain. Both the old tunnel and the new one mentioned by Holmes[16] were found caved in and abandoned. There was every indication of a former Indian camp site in this vicinity. Half an hour's search resulted in the discovery of a pestle and a flat stone muller, a few yards north of the mine buildings. Similar discoveries were reported by Holmes. South of the tunnel, a large permanent mortar was found. The material of this mortar block is latite from the cliff above. It is quite possible that the implements mentioned by Mr. Neale came from this Indian camp site.

The McTarnahan Mortar.—In the discussion of Dr. Becker's paper, Rev. G. Frederic Wright mentioned the discovery of a mortar reported to him by Mr. C. McTarnahan, as follows:*

"The discovery was made in October, 1887, in the Empire mine. . . . This mine is on the western side of Table Mountain. . . . This mine lies nearly westward from Shaw's Flat, and, from the opening, penetrates the rim underneath Table Mountain a distance of 742 feet. Mr. McTarnahan himself found the mortar in the gravel, as work was proceeding, 500 feet from the outside of the rim, which, from the direction of the drift, would make it 200 feet from the apex of the rim under the surface of the basalt. He described the mortar as a granite boulder about eight inches in diameter, and the hollow four inches in diameter at the surface and three inches deep." Mr. Frank McTarnahan, who resides not far from the Empire mine, was interviewed by the writer regarding this relic. Both he and Mr. Charles McTarnahan, his brother, worked in the mine together. The only mortar found was discovered back of the lagging during the work of retimbering. The mine had been idle at least two years before the McTarnahans began work. The mortar was not in the gravels, but thrust in back of the lagging, as large pieces of rock and

[16] Loc. cit. p. 451.

* Bull. Geol. Soc. Amer., Vol. 2, p. 199.

boulders commonly are used to fill up space room between the timbers and the wall. It is evident that an implement lying loose behind the timbering of an old mine can not be accepted as indicating great antiquity.

Implements from the Marshall Mine.—Human relics are reported by Whitney from the Marshall mine near San Andreas, Calaveras County. The published statement[17] is in the form of an affidavit, as follows:

San Andreas, Calaveras County, California,
January 3rd, 1871.

"This is to certify that we, the undersigned, proprietors of the gravel claims known as Marshall & Company's, situated near the town of San Andreas, do know of stone mortars and other stone relics, which had evidently been made by human hands, being found in these claims, about the years 1860 and 1869, under about these different formations:

1. Coarse gravel	5 feet
2. Sand and gravel	100 feet
3. Brown gravel	20 feet
4. "Cement" sand	4 feet
5. Bluish volcanic sand	15 feet
6. Pay gravel	6 feet
	150 feet

The above (mentioned relics) were found in bed No. 6."

(Signed) R. D. Hubbard,
John Showalter.

The writer visited this locality and talked with Mr. J. C. Marshall, who was a part owner in the mine with Hubbard and Showalter. The mine is situated on the top of a hill a few hundred feet northwest of the Calaveras County Hospital in the outskirts of San Andreas. The hill is capped by a gravel of the inter-volcanic epoch, partly overlain on the southwest side by a small area of andesitic breccia. There are no outcrops of rhyolite tuff visible, but the tuff appears on many of the old mine dumps and is probably the "bluish volcanic sand" of the section. The pay gravels are probably inter-rhyolitic.

[17] Aurif. Grav. p. 274.

According to Mr. Marshall, the implements were found by hired men at the time when he was employed as mine boss. He claimed to have seen them in place in the pay gravels close to the bed-rock. One of the mortars had several holes in it and would weigh, he thought, two or three hundred pounds. It was too heavy to hoist out by the whim and was left in the drift. He did not remember how far they were from the bottom of the shaft from which the drift started. The workings have caved in and are inaccessible.

On the top of the hill, in the immediate vicinity of the old Marshall shaft, there are several large blocks of quartz and granodiorite with one or more mortar holes worked in each. At least one of the mortars from the Marshall mine was of this recent type, although said to occur beneath the rhyolite tuff. There are a number of old shafts on the hill, all more or less caved in, so that it is quite possible that the implements, and especially the large permanent mortar fell down one of these shafts, to be afterward struck by the Marshall drift.

The Clay Hill Skeleton.—The discovery of a human skeleton in the gravels on Clay Hill, in the vicinity of Placerville, Eldorado County, is vouched for by Dr. H. H. Boyce. The following extract is from a letter by Dr. Boyce published by Whitney:

"Clay Hill is one of a series of elevations which constitute the water-shed between Placerville Creek and Big Cañon, and is capped by a stratum of basaltic lava, some eight feet thick. Beneath this there are some thirty feet of sand, gravel and clay. The country-rock is slightly capped on this, as on most of the elevations, the slope being toward the center of the hill. Resting on the rock and extending about two feet above it, was a dense stratum of clay. It was in this clay that we came across the bones. While emptying the tub, I saw some pieces of material which on examination I discovered were pieces of bones; and, on further search, I found the scapula, clavicle, and parts of the first, second and third ribs of the right side of a human skeleton. They were quite firmly cemented together; but on exposure to the air began to crumble."

On examination the geological features of Clay Hill were found by the writer to differ in several respects from the above de-

scription. No basalt capping appeared either on the hill or anywhere in the vicinity. There is a small area of andesitic breccia on the top of the hill, but this is not very well exposed in the sections afforded by the old placer mines. Most of the hill is capped by an andesitic gravel, beneath which there is, in some places, a light gray tuffaceous sand, containing frequent small andesite pebbles. The pay gravels beneath the sand are not remarkably quartzose and seem to grade into the andesitic material above mentioned. The lithology of the gravels resting on bedrock can not be satisfactorily studied owing to the heavy talus slopes. For this reason the position of the clay supposed to contain the bones can not be confirmed.

The impression conveyed by the part of the letter quoted is that the skeleton found by Dr. Boyce was at a depth of thirty-eight feet, in undisturbed strata under eight feet of so-called basalt. There is nothing, however, in the letter to show that this was the section passed through in sinking the Boyce shaft. The skeleton may have been found in such a place and at such a depth in the clay that the possibility of recent interment would have to be considered. As the evidence is presented, we are not justified in regarding the skeleton from Clay Hill as of great antiquity.

The Calaveras Skull.—The history of this famous relic is so well known that it is not necessary to repeat at length the details regarding it. The nature of the matrix and filling of the skull present evidence of a geological nature sufficient to settle once for all that it did not come from the gravel as had been supposed.

The skull first came into prominence in 1866 when it was forwarded by Dr. Jones to the office of the state geologist in San Francisco. Regarding its discovery by Mr. Mattison and its subsequent history, Whitney made the following statement:*

"Mr. Mattison, on being questioned, stated that he took the skull from his shaft in February, 1866, with some pieces of wood found near it, and, supposing that it might be something of interest, carried it in a bag to the office of Wells, Fargo & Co.'s Express, at Angels, and gave it to Mr. Scribner, the agent.

"Mr. Scribner's clerk cleaned off a portion of the encrusting

* Aurif. Grav., p. 268.

material, discovered that the article in question was a human skull, and, shortly after, gave it to Dr. Jones, ... and in his possession it remained for some months before it was placed in the writer's hands."

Bald Hill (plate 13) is a rather prominent hill rising a little more than one hundred feet above its base. It forms part of a ridge extending about half a mile toward the northeast, where it merges with a table-like expanse capped by an andesite flow. The top of the entire ridge to the contact with the andesite is occupied by a mass of gravel containing andesite pebbles as well as numerous pebbles of vein quartz, quartzite, granodiorite, various porphyrites, etc. Beneath these gravels are rhyolite tuffs, shown in the photograph, on the lower slopes, as white patches among the trees. The upper gravels lie unconformably on the tuff, occupying depressions eroded in the latter. To the northeast, they disappear beneath the andesite flow. These particulars can be gained, in part only, from the Jackson Folio of the United States Geological Survey Atlas, which does not show the gravels lying above the rhyolite. These upper gravels belong to the intervolcanic epoch. They are thoroughly water-worn.

The pay gravel which has been worked by various cuts, shafts and tunnels lies beneath the rhyolite tuff, and may be seen in place in the walls of a cut at the southwest end of the hill. The pebbles are largely quartz, amphibolite and schists of the Calaveras formation with an occasional porphyrite, and with the exception of the quartz are quite thoroughly decomposed. They are inclosed in a fine clayey matrix composed largely of rhyolitic ash. In color they are a pale greenish tint. These gravels belong to the rhyolitic epoch. They are exposed in the cut to a thickness of about a foot. Bedrock may be seen a few yards to the southwest, but the contact of the gravel with the bedrock is concealed in the cut by mine dump and talus. There is no trace of calcareous or ferruginous cementation. The pebbles are flatter than those of the upper gravel, but are equally water-worn.

The following section is given by Whitney,[18] as that passed through by Mattison in sinking the shaft on Bald Hill:

[18] Aurif. Grav. p. 269.

Bald Hill, looking south. The Mattison shaft is about half way up the slope, almost immediately below the large pine tree on the top. Arrow points to shaft.

1.	Black lava	40 feet
2.	Gravel	3 feet
3.	Light lava	30 feet
4.	Gravel	5 feet
5.	Light lava	15 feet
6.	Gravel	25 feet
7.	Dark brown lava	9 feet
8.	Gravel	5 feet
9.	Red lava	4 feet
10.	Red gravel	17 feet
	Total	153 feet

The various "lavas" are difficult to identify, and are probably not correctly determined. The "black lava" is a rhyolite darker in color and harder than the common white tuff. The shaft was started in this rock a few feet below the contact of the rhyolite tuff and the overlying gravels. The skull is said to have been found "in bed No. 8, just above the lowest stratum of lava."

The matrix of the skull is described by Whitney[19] as follows:

"When delivered into the writer's hands its base was imbedded in a conglomerate mass of ferruginous earth, water-worn pebbles of much altered volcanic rock, calcareous tufa, and fragments of bones. This mixed material covered the whole base of the skull and filled the left temporal fossa, concealing the whole of the jaw. A thin calcareous incrustation appears to have covered the whole skull when found; portions of it had been scaled off, probably in cleaning away the other material attached to the base.

"Nothing was done to the skull to alter its condition in any way, after it came into the writer's hands, until it had been examined by Dr. Wyman, when we together carefully chiselled off the foreign matter adhering to its base . . . . . .

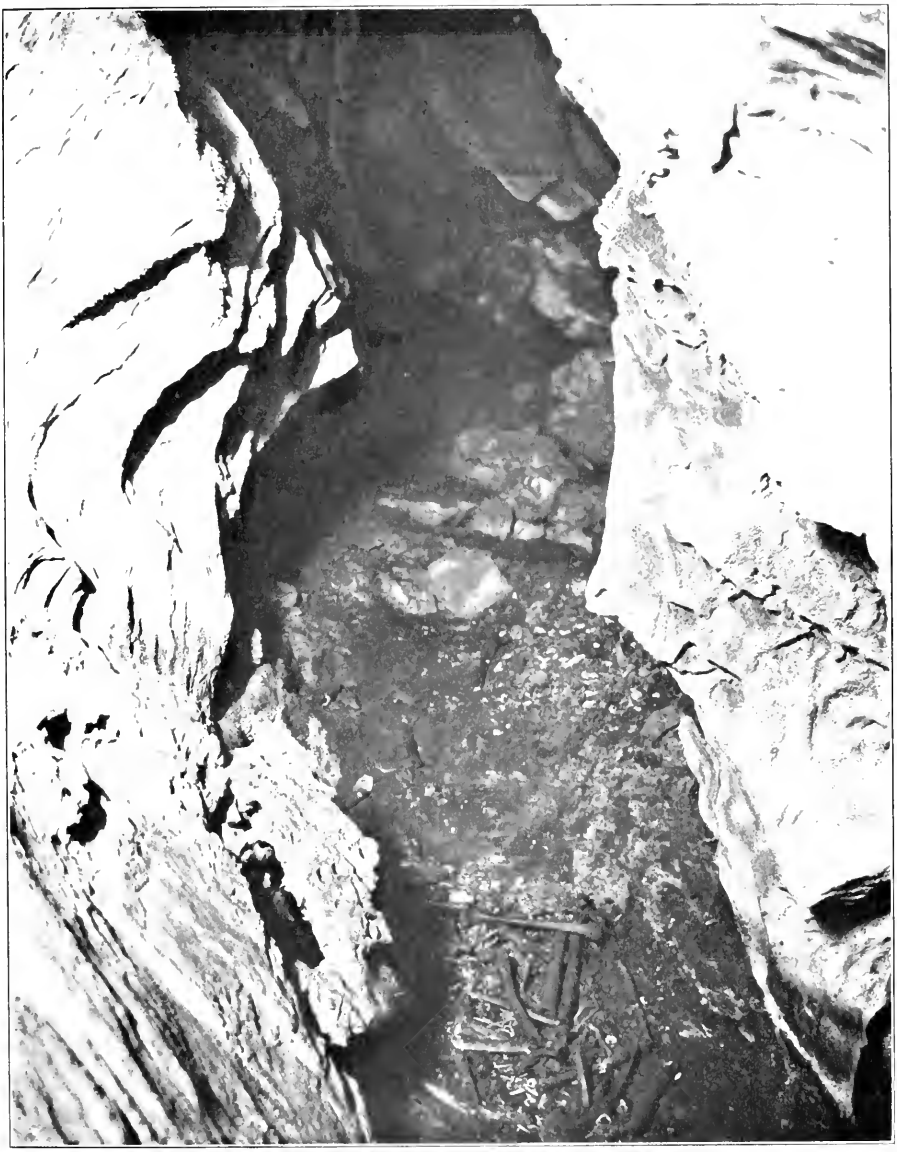
"In cutting away the mixed tufa and gravel which covered the face and base, several fragments of human bones were removed; namely one whole and one broken metatarsal; the lower end of a left fibula, and fragments of an ulna, as well as a piece of a sternum. These bones and fragments of bone might have belonged to the same individual to whom the skull had appertained; but, besides these, there was a portion of a human tibia

[19] Aurif. Grav. p. 268.

of too small size to be referred to the same person. There were also some fragments of the bones of a small mammal. Under the malar bone of the left side a small snail shell was lodged, partially concealed by one of the small human bones which was wedged into the cavity. This shell was recognized by Dr. J. G. Cooper as *Helix mormonum*, a species now existing in the Sierra Nevada. Cemented to the fore part of the roof of the mouth was found a circular piece of shell four tenths of an inch in diameter, with a hole drilled through the center, which had probably served as an ornament. Several very small pieces of charcoal were also found in the matter adhering to the face of the skull."

Through the kindness of Professor F. W. Putnam of Harvard University, the writer has been able to examine a portion of the gravel removed by Professor Wyman from the skull, and also the skull itself. Both gravel and skull still bear traces of the wax with which the latter was coated as a preservative. The matrix is not strictly speaking a gravel nor does it show any trace of wear or rounding by stream action. It is composed of angular fragments of white marble (dolomite), decomposed diabase, amphibolite and white vein quartz cemented by a ferruginous calcareous deposit. Small masses of limonite and ochreous clay are present in vacuities in the stalagmite. Small grains of hematite were also detected. Fragments of charcoal and small portions of the shell of a land snail adhere to the stalagmite. The material is dissimilar in every respect to either of the gravels exposed on Bald Hill. In every respect it is comparable to a cave breccia. The association of rock species and the stalagmitic cementation is the same as that found in the breccias on the floors of many caves in Calaveras county which the writer has examined. The lack of agreement between the gravels on Bald Hill and the matrix of the skull effectually establishes the fact that the skull was not obtained in place, as claimed, in the gravels beneath the rhyolite, or from any other gravel of the rhyolitic epoch. None of these gravels exhibit any trace of stalagmitic cementation.

The cave origin of the skull is strengthened by the animal remains and works of art associated with it. In addition to the



Mortuary chamber in a cave above Cave City, Calaveras County. The remains of several individuals are shown. (Flashlight.)

bones of a smaller human individual, there was with the skull a shell bead and the bones of a small mammal. Imbedded in the stalagmite investing fragments of the breccia received from Professor Putnam, the writer found the incisor tooth of some small mammal, possibly a bat or a mole, and an amphicoelous vertebra of a small amphibian. This material is not complete enough for generic determination, but there is no reason for regarding the remains as those of extinct forms. The shell bead has been examined by several archaeologists, who state that it is similar to those found on many Indian sites of the coast region of California.

The scarcity of vertebrate fossils in the auriferous gravels is well known to all geologists familiar with these deposits. The abundance of bones, human and animal, associated with the skull is remarkable in the light of the supposed career depicted by Whitney for this relic before it was finally imbedded in the gravels of a Neocene river.* The effect of even a moderate amount of stream action would be to scatter rather than to collect the various parts of a skeleton. The smaller bones would inevitably be ground to powder. The larger bones should show traces of abrasion rather than fresh fracture as is the case.

The caves of Calaveras County present conditions similar to those indicated by the matrix and remains associated with the Calaveras skull. Many of them have served as Indian mortuaries. A good illustration of one of these will be found on plate 14. A heterogeneous mixture of human remains similar to that shown in this photograph would account for the association of the bones of two individuals with the skull. The human bones found in these caves are often coated with stalagmite and have lost the greater part of their organic matter. Animal remains are commonly present in the earth and breccia on the cave floors. Shells of *Epiphragmophora* (*Helix*) are almost always present.

It is supposed by some that the Calaveras skull came originally from Salt Spring Valley. Holmes[20] states on the authority of Mr. George Stickle of Angels, that the skull, together with a companion specimen, had been placed on exhibition in Stickle's store by Dr. J. I. Boone, who obtained it in an Indian burial ground

* Aurif. Grav. p. 272.

[20] Smithsonian Rept., 1899; Am. Anth., p. 634.

in Salt Spring Valley. There are no deposits in the Valley resembling the matrix of the skull. On the Tower-Bisbee ranch there are yellow gravels containing subangular and also well rounded pebbles derived from the rocks in the immediate vicinity (diabase, porphyrite, amphibolite and slate). More or less ferruginous cementation has taken place. These gravels are either very late Pleistocene or recent. No fragments of marble were found in any of these deposits, nor are any limestones mapped[21] in this vicinity.

Most of those who regard Salt Spring Valley as the place of origin of the skull, agree in stating that it was found in Dead Man Spring. This is a large boggy hole from which between thirty and forty human skulls were taken by Mr. Hetic in 1854. The spring waters are largely alkaline. The mud filling the spring is black, deriving its color from decomposing vegetable matter. The soil about the spring where not in contact with the water, is red and contains angular fragments of amphibolite and vein quartz. The bones were imbedded in the spring mud and are described by Mr. Hetic as black. South of Dead Man Spring there is another alkaline spring in the vicinity of which angular blocks of quartz and amphibolite are coated with a small amount of calcareous tufa inclosing fragments of the same rocks.

It is not the object of the present paper to determine certainly the original place of burial of the skull.* The writer has re-

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[21] Jackson Folio, U. S. G. S. Atlas.

* The following note which Professor Putnam has kindly furnished, brings out particularly the fact that the Calaveras skull described by Whitney is not certainly to be identified with any of the skulls which may have been used in attempts to deceive Mr. Mattison or others:

"In 1897 the 'Calaveras Skull' came into the possession of the Peabody Museum from the estate of Professor Whitney, who had expressed the wish that the skull, with all the material pertaining to it, should be given to the Peabody Museum for permanent preservation. I soon realized the importance of making a comparison of the matrix taken from the skull by Professors Whitney and Wyman with the gravel from the Mattison shaft. At my request, early in September 1900, Professor Richard E. Dodge visited Bald Hill for the purpose of obtaining gravel from the layer in which the skull was said to have been taken by Mattison, but the shaft was full of water and the gravel could not be obtained. Mr. Dodge heard several stories relating to the skull such as those that have been reported by Professor Holmes and Mr. Sinclair.

"On September 26-29, 1900, I was in Angels with the hope of making arrangements to have the water pumped from the shaft, but I soon found out that even if this were possible it would be a very long and expensive operation and I therefore abandoned the attempt. While making my examination on Bald Hill I secured the assistance of a Mr. Lee, who had been employed

ceived a letter from Rev. W. H. Dyer of Los Angeles inclosing a clipping from the "Tuolumne Independent" of September 14th, 1901, in which it is stated, over Mr. Dyer's signature, that he was in Scribner's store in Angels, "probably near the year 1876 and found Dr. Walker and Mr. Scribner and another whose coming, after long absence, brought the three old friends together . . Prominent in interest was the story of the skull, which they had planted deep in the bottom of the shaft where it astonished the miner, the curious public and the wondering scientists." In his letter, Mr. Dyer states that he has received a communication from Mrs. Jamison, the sister of John C. Scribner, now living in Tarrytown, New York, to the effect "that they have long known as a joke of his, the planting of a skull in a mine."

Negative Evidence of a General Character.

The occurrence in the older auriferous gravels of human remains indicative of a state of culture and a degree of physical

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on the latest working of the shaft, and he pointed out, on the old dump, the several layers of gravel through which the shaft was sunk, and samples were gathered from the different portions of the dump.

"Again in September, 1901, I visited the place with Professor Merriam, but the water still prevented our entering the shaft. While at Angels and at Murphys I heard many stories, from various persons, and received several letters, to the general effect that a skull had been placed in the shaft for Mr. Mattison to find. To my mind the most interesting point of these stories is that two and possibly three distinct skulls were brought into the stories. One man said the skull was black and enclosed in black earth and that it came from Salt Springs valley, where a dozen or more were found. Mr. Stickle, on the contrary, told me that the skull was whole and white. When I showed Mr. Stickle the photograph taken by Mr. Rhodes of the skull that Professor Whitney received from Dr. Jones (showing the skull before the matrix was removed) Mr. Stickle was very emphatic in his statement that it was not the skull brought out of the shaft by Mattison.

"It would seem therefore that there is a possibility that the skull given to Dr. Jones and by him to Professor Whitney was never in the shaft. Had it been taken from the shaft there probably would have been some trace of gravel, such as is found in the beds through which the shaft was sunk, mixed with the material taken from the skull by Professors Whitney and Wyman, but no such gravel has been found in the several examinations which have been made of the matrix.

"When all the facts now known are carefully considered it seems probable that the skull which came into Professor Whitney's hands, through Dr. Jones, was from some cave or rock crevice in the vicinity of Bald Hill, and that, without any attempt at deception on the part of Dr. Jones, and without any intention on the part of any one to deceive the members of the Geological Survey, the skull was sent to the Survey by Dr. Jones with the belief that it was the skull which, he had been told, Mattison found in his shaft."

F. W. Putnam.

Department of Anthropology,
University of California, Dec. 5, 1907.

development equal to that of the existing Indians of the Sierra Nevada would necessitate placing the origin of the human race in an exceedingly remote geological period. This is contrary to all precedent in the history of organisms, which teaches that mammalian species are short-lived. In North America, there are abundant remains of the lower mammals preserved in deposits ranging from the Eocene to the Pleistocene. In all these deposits, excepting those of late Pleistocene age, the remains of man or any creature directly ancestral to man are conspicuously absent. No remains of the Anthropoidea (from which man is doubtless derived), are known on this continent.

The age of the gravels antedating the latite flows can not be definitely fixed until their flora has been studied. According to Lindgren,[23] "the deep gravels are probably of Eocene or Eomiocene age. The bench gravels and the rhyolite tuffs are probably of late Miocene age. The age of the gravels of the intervolcanic erosion epoch and of the andesite tuff is not established beyond doubt, but these probably belong to the early Oligocene or late Miocene." It has been shown on the preceding pages that a large proportion of the implements reported from the gravels are from those of the rhyolitic and intervolcanic epochs. This would mean that man of a type as high as the existing race was a contemporary of the three-toed horse and other primitive forms of the late Miocene and early Pliocene, a thesis to which all geological and biological evidence is opposed.

Conclusions.

A review of the evidence favoring the presence of the remains of man in the auriferous gravels, compels one to regard it as insufficient to establish the fact. On the preceding pages, it has been shown either that there have been abundant opportunities for the relics in question to be mixed with the gravels accidentally, or that the geological conditions at the localities are such as to render it improbable that the implements and bones have been associated in the gravels to the extent supposed.

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[23] Colfax Folio, U. S. G. S. Atlas. Descriptive Text, pp. 5 and 6.

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See also a department circular, "The Department of Anthropology," University of California, 1905, p. 16, where a statement is made of the results of studies in connection with the Calaveras skull. It was stated that the matrix surrounding the skull is unlike the auriferous gravel but is like material from caves.

Issued February 15, 1908.

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POMO INDIAN BASKETRY.

BY
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CONTENTS.

INTRODUCTION.

Basketry, one of the most important and interesting of the textile arts, reached in California a very high state of perfection, connected probably with the fact that the California Indians led sedentary lives in a country abounding in a great variety of vegetation, upon which they depended chiefly for food and shelter, and which at the same time provided many tough pliable fibers which might be woven or coiled into articles of use. The California Indians taken together had a very great variety of materials, forms, methods of manipulation, and ornamentation of basketry. By certain of them, of course, only a limited number of materials, techniques, and designs were used but among others a greater variety was found.

Among no other California people was there so great a variety in basketry as among the Pomo, who occupied the greater part of Sonoma, Mendocino, and Lake counties, and vicinity. It is with the basketry of the Pomo, and particularly with its designs and other ornamentation, that the present paper has to deal. Information upon the general features of Pomo basketry, and to a certain extent upon their designs, was collected during some years of residence in the Pomo region, but it was not until 1904 that an attempt was made to systematically collect and verify all information possible concerning Pomo basketry and basket designs. This work was conducted as part of the investigations of the Ethnological and Archaeological Survey of California

maintained by the Department of Anthropology of the University of California through the generosity of Mrs. Phoebe A. Hearst.

The general method pursued during the work was to question informants of three dialectic groups mentioned below, concerning the eight hundred and forty patterns shown on the photographs of three hundred and twenty-one Pomo baskets. Of this number seventy-one are photographs of baskets selected from the collections of the Museum of the Department of Anthropology of the University of California, one hundred and two are of a collection of baskets now the property of the Königliches Museum für Völkerkunde of Berlin, forty-one are from illustrations by Professor R. B. Dixon in his "Basket Designs of the Indians of Northern California,"[1] and the remainder are photographs of baskets seen among the Indians and from other miscellaneous sources. At the same time the Indians were also questioned concerning the designs on baskets they had, whenever this was possible. By securing good clear photographs of baskets it was found that informants had no difficulty in recognizing the designs, and that they were able to name them as easily as when they had the actual baskets before them. In this manner it was possible to obtain a greater range of information than otherwise could have been secured.

In all there are seven distinct and quite different dialects spoken by the Pomo, but of these only three, the Northern, Central, and Eastern, are to-day spoken by any considerable number of people. It is by the people of these three dialectic groups that basketry is most made and used at the present time, and it is chiefly from them that the information concerning basketry and basket designs was obtained.

With these people basketry in aboriginal times took the place of almost every sort of utensil, for the gathering, transportation, storage, grinding of vegetable products, cooking and serving foods, and for ceremonial and mortuary purposes. In short, from birth until death a Pomo used basketry for every possible purpose.

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[1] Bull. Am. Mus. Nat. Hist., XVII, pt. 1, plates 27 to 36, 1902.

MATERIALS.

FIBERS AND RODS.

The materials used by the Pomo in basket making may be divided into two classes, those from which the basket proper is made and which are selected on account of their strength, and those materials which are used entirely for ornamentation and serve no essentially useful purpose. Almost all Pomo baskets, whether coiled or twined, are made upon a foundation of slender willow stems. The only other material so used is hazel, the slender stems of which are employed in the same manner as those of the willow. This material was used only in the northern part of the territory occupied by the Northern division of the Pomo and is probably attributable to contact with the Athapascans to the north who used hazel exclusively. About these stems, except in certain coarse open-work baskets, are coiled or twined pliable dressed fibers of several sorts, differing in color, so as to produce different designs, thus combining both the qualities of strength and ornamentation. To the second class of materials, those used entirely for purposes of ornamentation, belong the beads and bits of shell, and particularly the various feathers, which are found so frequently on Pomo baskets of the finer and ceremonial types.

The simplest kind of basket is that made entirely of slender willow or hazel stems, either peeled or unpeeled, these being used not only as the warp elements, but also being twined about as woof. Only the coarser open-work baskets, such for instance as fish and quail traps, coarse burden baskets, plate-form or hemispherical baskets used for sifting and as general receptacles, and seed-beaters, are made in this way. In these baskets the same method of manipulation, namely, plain twining, is found as in the brush fences built to snare or entrap deer, elk, rabbits, and quail, or in the brush wiers built across the streams for the trapping or spearing of fish. One type of seed-beater is also made in wickerwork. All baskets other than the coarse open-work ones above mentioned are made of two or more materials, the slender willow or hazel stems always being used as the foundation material.

There are several pliable dressed fibers which serve as wrapping material in coiling or as woof in twining. The most commonly used and most important of these materials is the root of the sedge, *Carex barbarae*. This plant, which grows about many of the springs and streams in the mountains but more particularly on the margins of lakes and ponds, produces a very long root stock the center of which is a tough woody fiber. This is gathered by means of a digging stick, and the outer covering having been removed is split into two long filaments, which are then, along with others, coiled into a roll and stored until needed. It is then moistened and dressed down to a size suitable for the kind of basket for which it is intended. The fine woody fibers of this root make it possible to dress these sewing elements down to a size hardly larger than that of fine thread, and it is from this material that almost all the very finest Pomo baskets are chiefly made. It is the material most used as the white background in all Pomo basketry, particularly the finer twined and coiled work. Among the Eastern Pomo who live in the vicinity of Clear lake where sedge and carex are abundant, another species of sedge called by them katsa'-kūhūm was mentioned as producing a similar white material. It would appear, however, that this plant is very little used, as almost none of the material was seen among any of the Pomo.

The material of next importance is the bulrush, *Scirpus maritimus*. This likewise is obtained from the root stock of the plant, which grows chiefly in the mud of the lake shore, usually at some distance out in the water. The round central fiber of this stock is when gathered of a light pink color, but is changed to a jet black or to various shades of brown by being buried in a mixture of the rich black mud of the lake shore with ashes. The degree of blackness varies according to the length of time the fibers are allowed to remain in this mixture, but the intention is always to produce a jet black material and it is not very often that the roots are removed before they have reached this stage. This material is used chiefly on the finer coiled baskets and on fine twined baskets, though it may of course find use on coarser ones of both types. When used, it is almost invariably this material that is employed to make the design itself, the white material being usually considered by the Indians as the background.

Next in importance to the bulrush as a basket material is redbud, *Cercis occidentalis*, from which two colors are obtained. The bark of this shrub is of a reddish brown color when gathered in the spring of the year. It, like the other materials, is split into long strips and made into coils which are stored until needed. Its chief use is as a red material, the outer surface of the outer bark being the part used in working out the design. There is also an inner bark, or more properly what is commonly called the sap wood, which produces a white material, which although not much used is occasionally found. The inner surface of the outer bark may also be brought into view instead of breaking this material off and inserting a new element of an ordinary white material. This may be considered a second white material obtained from the redbud. Also, upon soaking, the reddish outer surface of the bark changes to a dead black. These last two materials, however, are very rarely met with among the Pomo, though the first is frequently found among the Yuki to the north of the Pomo. The redbud when used as a red material is chiefly employed in designs on twined basketry, though it is also occasionally found upon coiled.

There are two other white materials which are in general use, one being the small inner fiber of the root of the willow, *Salix* sp. So far as has been found there seems to be no very great preference for any one of the several species of willow which abound in the Pomo country, the slender roots which grow out into the water of lakes and streams being taken from all. Some maintain that the best fiber is obtained from the root of the same willow the stems of which are used as the foundation material. This material is sometimes used in the finer coiled baskets, but is chiefly used in twined or in coarse coiled work. It must, however, be counted as one of the materials more rarely used and is said by the Indians themselves to be much inferior to sedge or pine root on account of its brittleness when dry.

The other white material found in use among the Pomo of these three divisions, is the root of what is commonly called the digger pine, *Pinus sabiniana*. Various sized roots of this pine are dug, and after being heated in hot ashes or by holding them directly over the fire, are split into long coarse fibers, which are

coiled and stored for use. By wetting, these, like the other materials, become pliable and may be split into fibers of almost any desired size. They find use almost exclusively in the making of large twined baskets, and while not so much used as the sedge are quite often found. In addition to these two white materials there is still another obtained probably from the root of the juniper, *Juniperus occidentalis.* This, however, appears to be very little used. Its preparation and uses are the same as those of the digger pine.

There is a second black material, the root fiber of the bracken, *Pteridium aquilinum.* Within the root of the bracken there are several flat fibers sometimes reaching a width of three-eighths of an inch. These are when gathered a light brown in color, and are usually made into coils and stored until needed, though they may be treated to blacken them immediately. This is done by boiling them for a short time, and here again the length of time they are treated governs the blackness of the fiber, so that it sometimes happens that baskets are found with this fiber in various shades of brown instead of black. It is, like the bulrush, used entirely as a material in which to work basket designs on a background of various white materials, and finds use chiefly in the finer twined baskets or in coarser coiled work. It is also noticeable that this material is, at the present time at least, more frequently used upon the immediate coast than in the interior valleys, though it is quite frequently found there also.

The above mentioned constitute the materials used for making Pomo baskets in general. There are, however, two other materials which find special uses in basketry. One is the sap wood of the grape, *Vitis californica.* The sap wood of the grape is a very tough pliable fiber and found general use among the Pomo as a binding material, being used for everything where a twisted string or rope of strands of twisted fiber was not absolutely demanded. It thus found use to a certain extent in the making of brush fences for the capture of various kinds of game, it was used to bind rafters, stringers, and posts in the making of the large ceremonial earth lodges, and in all other cases where a strong pliable binding material was required. In connection with basketry it finds use in binding the hoop which is always placed

about the opening of a conical burden basket or about the upper opening of a mortar or milling basket, and occasionally about the opening of a basket of the openwork sifter type.

A second specialized material is the tule, *Scirpus.* The long stems of two species are used, one, *Scirpus lacustris* var. *occidentalis*, with a circular cross section; the other, *Scirpus robustus,* with triangular cross section. As might be expected, these materials were not found throughout the Pomo region, but were chiefly confined to the vicinity of lakes and ponds, and it was only in such regions as the vicinity of Clear lake that they were used to any extent. They were employed for making certain plain-twined baskets, but from the nature of the material no fine work could be done with them. Their chief use was in the vicinity of Clear lake, where, in addition to baskets, boats were made from the first mentioned, and mats and house thatch from the second.

In addition to the slender willow stems above mentioned, used in almost all cases as foundation material, and the root, used as a weft or sewing material, the willow provides one other material used in connection with basketry, namely: the heavy hoop bound about the opening in the conical burden basket, and about the upper opening in the mortar or milling basket, as also about the opening of some baskets of the openwork sifter type.

FIBER MATERIALS.

English	*Northern*	*Central*	*Eastern*
Sedge (*Carex barbarae*)	kūhū'm	kūhū'm	kūhū'm
Sedge (*Carex* sp.)	kadī' kūhūm		katsa'-kūhūm
Bulrush (*Scirpus maritimus*)	tsīwi'c	tsīwi'c	tsīwi'c
Redbud (*Cercis occidentalis*)	mille	kala'ia	dīsa'i
Redbud (inner bark)	millē-to'i	kala'ia-katō	dīsai-tō'ts, tacī'ma
Digger pine (*Pinus sabiniana*)	kale'-ce	kale'-ce	kale'-ce
Juniper (*Juniperus occidentalis*)		cateo'm	cate'p
Willow root (*Salix*)	kala'l-yem, ma-yem	ma'-ce	gaiī'-ce

English	*Northern*	*Central*	*Eastern*
Bracken (*Pteridium aquilinum*)	bi'S-yem	mao'dō-kit	lī'bītsits
Grape (*Vitis californica*)	cīyi'n	*ctin*	*ctīn*
Tule[2] (*Scirpus lacustris* var. *occidentalis*)	badjō'	bateō'	bag'ō'
Tule[2] (*Scirpus robustus*)	gīca'l		gūca'l
Willow stem	kala'l, bam	kala'l	tsū'baha
Willow hoop	dakō'	dako'	dakō'
Hazel (*Corylus rostrata* var. *californica*)	batī		

FEATHER AND SHELL MATERIALS.

One of the most noticeable and characteristic features of Pomo basketry, and the feature which did much to bring it into great favor with collectors, is feather decoration. Certain other peoples, the Yuki, the southern Wintun and perhaps others in northern California, and the Yokuts and Shoshonean tribes and perhaps others in south central California, used feathers to a very limited extent on certain specialized forms of baskets, but no other California people appear to have used feathers to entirely cover their baskets as was done by the Pomo. In recent years the Yuki, the southern Wintun, the Yukian Wappo and the portion of the Moquelumnan stock living north of San Francisco bay, all of whom were immediate neighbors of the Pomo, have made some attempt at elaborate feather decoration but so far as can be learned no such decoration was practiced by them in aboriginal times, and very few if any good specimens of elaborately decorated baskets are now made by them. The Pomo, on the other hand, have so far perfected this form of decoration that they are able to cover their baskets completely with feathers, and good basket makers can so place them that the surface of the basket has almost the smoothness of the breast of a bird itself. Such feathered baskets are shown in pl. 21, figs. 1, 2, 4, 5. Some of the older basket makers maintain that in aboriginal times they used only the feathers from the top of the

[2] The first of these species of tule has a stem with circular cross-section, while the stem of the second has a triangular cross-section.

head and from the throat of the redheaded woodpecker, those from the head of the mallard duck, and the top-knot of the quail. Others however state that the feathers of several other birds were also used, and at the present time feathers from the following species are employed.

From the bright red crest of the redheaded woodpecker, *Melanerpes formacivorus*, small feathers are obtained which are used in various ways in basketry, chiefly in the making of the red feathered basket which has become known to the whites as the "sun basket," though it is not so called by the Indians themselves. In addition to this basket, the surface of which is entirely covered with red feathers from the head of the woodpecker, various other baskets are decorated with these and other feathers. Some are covered completely while others are covered only partially as is shown in pl. 19, fig. 4, where the red feathers of the woodpecker are scattered at intervals over the surface of this boat-shaped basket except where the pattern itself appears. Often they are used with other feathers in such a manner that very effective patterns like those made in basket fibers are worked out. No very elaborate patterns however are attempted in feathers. Upon the throat of this same bird there is a patch of feathers of lemon color which are also used in basket decoration.

Next in importance to the red feathers from the woodpecker are the jet black plumes from the top-knot of the California valley quail, *Lophortyx californicus*. These, while they are never used as the complete covering of a basket, are much employed to ornament the borders of feathered baskets as is shown in pl. 21, fig. 2, or to scatter over the surface among other feathers. They are also often used even upon the finer twined baskets without other feathers as is shown in pl. 16, fig. 6. The plume of the male is much longer and is more highly prized than that of the female, but both are used. Occasionally also, though it occurs so rarely that this can hardly be counted as one of the regular basket materials, the long slender black plume of the California mountain quail, *Oreortyx pictus*, is used in the same manner as the shorter club-shaped plume of the valley quail.

The green head of the mallard duck, *Anas boschas*, also provides an important material for ornamenting baskets. Baskets

are entirely covered with these green feathers in the same manner as with the red feathers of the woodpecker, and by analogy this basket has become known to the whites as the "moon basket," although here again without any valid reason, as the Indians do not call it by any such name.

Another bird, the feathers of which are considerably used, is the meadowlark, *Sturnella magna*. The yellow feathers from the breast of this bird are at present frequently used.

The feathers of the bluebird, *Sialia*, are occasionally used, as are also the feathers of the California jay, *Cyanocitta californica*.

The oriole, *Icterus bullocki*, provides feathers of an orange color which are used with the lighter yellow feathers of the meadowlark.

The feathers of the varied thrush, *Ixoreus naevius*, commonly called the mountain robin, which has a dark brown breast, are often used at the present time and produce a very pleasing effect.

The feathers of the ordinary robin redbreast, *Merula migratoria*, are used, at least by some basket makers, to a very limited extent.

The red feathers from the shoulder patches of the red-winged blackbird, *Agelaius phoeniceus*, are sometimes employed in basketry. The black feathers of this bird are more rarely used.

One other kind of feather which has upon one or two occasions been noticed in use is that from the black head of the brant, *Branta canadensis*.

All these feathers except the quail plume are used only upon coiled baskets and among these chiefly upon baskets of three-rod foundation.

Together with the feather ornamentation goes the ornamentation with shell and magnesite beads, and with variously shaped bits of iridescent abalone shell. The disk beads of clam-shell, *Saxidomus nuttallii*, are used about the opening of a basket as a border, being placed in a continuous line, as is shown in pl. 21, figs. 5, 6, or in groups of usually three or four beads at three or four equidistant points about the opening, as is shown in pl. 19, fig. 4. They are also made into ornamental handles, such as those shown on the baskets in pl. 21, by which the finer, particularly feathered, baskets are hung, and are also used for making

pendants which are suspended from the border of the opening or from various points over the surface of the basket, as is shown in pl. 21, fig. 2. The red magnesite disks are but rarely found on baskets, but when used are employed in the same manner as the white clam-shell beads. Variously shaped, usually triangular, bits of iridescent abalone shell are placed at the ends of the pendant strings of beads as is shown in pl. 21, figs. 1, 2, and pl. 19, fig. 5. For the fastening of these beads and abalone pendants, as also for the making of the bead handles and for the fastening of the beads about the border of the basket, native string of milkweed or other native fiber was used in aboriginal times. However in some cases where beads are attached singly at intervals over the surface of a basket, as is shown in the large lattice-twined storage basket in pl. 17, fig. 2, they are fastened with the sewing or twining fiber itself. Beads, like feathers, are rarely used on twined basketry, and their chief use is together with feathers on coiled baskets of three-rod foundation, though they are often used without feathers upon both three-rod and single-rod foundation baskets.

FEATHER AND SHELL MATERIALS.

English	*Northern*	*Central*	*Eastern*
Redheaded woodpecker *(Melanerpes formacivorus)*	kata'tc	kata'k	kara'tc
Mallard *(Anas boschas)*	kaia'n	kaia'n	kaia'n
Quail, valley *(Lophortyx californicus)*	caka'ka	caka'ka	cag' a'x
Quail, mountain *(Oreortyx pictus)*	kohō'ī	kohō'ī	
Lark *(Sturnella magna)*	djicī'l	cīl	gūcī'lī
Oriole *(Icterus bullocki)*	ka'iyōyū	kaiyōī	tsaga'tsagaū
Red-winged blackbird *(Agelaius phoeniceus)*	bilī'ya	tsilī'	tsū'Lī
California Jay *(Cyanocitta californica)*	tsai	tsai	tsai
Bluebird *(Sialia[3])*	kalītcō'tcō	ta'-tsakat	kacī'ltsīya

[3] Two species of bluebird, the Western bluebird, *Sialia mexicana*, and the Mountain bluebird, *Sialia arctica*, are found in this region.

English	*Northern*	*Central*	*Eastern*
Robin *(Merula migratoria)*	tsīto'ktok	tsatō'tō	tsitō'tō
Varied thrush or mountain robin *(Ixoreus naevius)*	sī'wa	sī'wa	sī'wa
Yellowhammer or red-shafted flicker *(Colaptes cafer)*	batsī'ya	katsī'ya	tīya'l
Brant *(Branta canadensis)*			
Shell beads *(Saxidomus nuttallii)*	ka'ia	*talē'ya*	ca'tanī
Magnesite beads	po	po	pol
Abalone shell *(Haliotis)*	te'm-gata	wīl	

TECHNIQUE.

TWINING.

In the matter of technique Pomo basketry shows great variety. The Pomo probably possessed a greater number of weaves than any other people in California. They had one weave, lattice twining, possessed by no other people, so far as is now known, except the Yukian Huchnom, whose small territory joined that of the Pomo on the north and who, while entirely distinct in language, are in culture very similar to the Pomo. Excluding from consideration temporarily the special weaves used for finishing borders of baskets, the Pomo have five distinct forms of twining:[4] plain-twined, diagonal-twined, lattice-twined, three-strand-twined, and three-strand-braided. Of these twined weaves the first three are in common use, while the two three-strand weaves are chiefly used in starting the bottoms of baskets and in finishing the borders. Three-strand twining is sometimes used throughout an entire basket such as is shown in pl. 25, fig. 6. Three-strand braiding is almost never so used.

The plain-twined method of weaving is on the whole the most used. It is employed for all forms of twined basketry, including

[4] The terms used in connection with weaves in the present paper are those so well and completely described and defined in Professor Otis T. Mason's "Aboriginal American Basketry," Ann. Rep. Smith. Inst., pp. 221-278, 1902.

some which are never made in other twined weaves. Basketry among the Pomo, as among almost all aboriginal peoples, is essentially a woman's art, and all of the coiled and practically all twined baskets are made by the women. The men employ only the plain twined and the three-strand twined weaves. The first they use in making fish traps of five forms, shown in pl. 27, figs. 2-6; quail traps, pl. 28, fig. 3; and occasionally coarse openwork burden and storage baskets, pl. 26, though the burden baskets are sometimes also made by the women. Three-strand twined weaving is only used occasionally in an openwork burden or a hemispherical openwork basket of the sifter type, such as is shown in pl. 25, fig. 6. Diagonal and lattice twining are also much used in the making of cooking baskets, like those shown in pl. 16, fig. 3, and pl. 17, fig. 4; plate-form baskets used for winnowing, parching, etc., like those shown in pl. 23, figs. 1, 2; and large tightly woven storage baskets, like that shown in pl. 17, fig. 2. Lattice twining also finds frequent use in the making of hemispherical or plate-form openwork baskets (pl. 25, fig. 3), used as sieves and general utensils. On the other hand this weave is never used in making conical burden baskets, while diagonal twining is very frequently so used (pl. 22, figs. 1-5).

A special weave related to lattice twining is employed in the making of one form of basket, the cradle. As in lattice twining, there are rigid elements running both vertically and horizontally; and like it also, the pliable weaving elements are two in number. The single horizontal rigid element is in all respects the same as that used in lattice twining except that in some cases at least it is semicircular instead of circular in cross-section. The two pliable weaving elements are, however, usually some form of string, though the ordinary weaving fibers are sometimes used. In the case of lattice twining these pliable elements are manipulated as in plain twining, except that in the twining they include not only the vertical elements but also the horizontal one. In the special weave used in cradles, however, these two pliable elements are woven together in a very intricate fashion, the details of which may be seen in pl. 15, fig. 7.

In the exact manipulation of the elements used in the various kinds of weaving there are certain differences to be noted. All

tightly woven baskets are made with a downward turn[5] of the woof strands and nearly all openwork baskets are made with an upward turn of these elements.

Since the men make no tightly woven baskets, and the women make very few openwork baskets, it may be said in general terms that the upward turning of the woof is employed by men and the downward by women.[6] Since the women use plain twining, diagonal twining, lattice twining, three-strand twining, and three-strand braiding, all these are made with the downward turn of the elements. The men use only plain twining and three-strand twining and these, therefore, are the only ones which are made with an upward turn of the woof strands. Up-turned plain twining is found only in openwork burden baskets, fish traps, and flat baskets of the sifter type, and three-strand twining only in burden baskets and sifters, both of which, however, are rarely so made. No openwork diagonal-twined baskets are found, and lattice-twined openwork baskets are made only by women, and have the downward turn of the woof strands. The special weave used in making the cradle and illustrated in pl. 15, fig. 7, above referred to, is another technique employed by the men.

Both three-strand twining and three-strand braiding are always so woven that two of the strands appear on the outside and one on the inside of the basket. In almost all cases both these are so woven that each strand passes over two warp sticks on the outside of the basket, and over one warp stick on the inside. Exceptions occur only in the three-strand weaving immediately about the starting knots upon the bottoms of baskets. In such cases the number of warp sticks included in each turn may

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[5] By downward turn is meant twining which progresses in such a manner that when it is viewed from the end and in the direction toward which it progresses, the strands revolve about each other in a clockwise direction. Thus, when the outer surface of the basket is viewed, each woof strand, as it emerges from behind a warp stick takes a downward turn and passes behind a succeeding warp stick on the lower side of the line of twined woof strands. By an upward turn is meant, of course, the opposite of downward turn, and in this method of weaving the woof strands appear, when the outer surface of the basket is viewed, to pass from the lower side of the line of twining upward, and to disappear behind the warp sticks on the upper side of the line.

[6] The only exception to the latter part of this statement is in the case of openwork burden and openwork flat baskets of the sifter type, which are made by both men and women, though chiefly by men.

be doubled, thus making each woof strand pass over four stems outside and over two stems inside the basket. In the ordinary three-strand twining and three-strand braiding the inner surface of the basket presents the same appearance as a basket of plain twined weave, while in cases where the woof strands pass over twice the usual number of warp sticks the appearance of the inside is that of diagonal twining. The outer surface in the latter case appears quite different from the surface of ordinary three-strand weaving. The woof strands appear to overlap each other much more, by reason of their passing over four instead of two warp sticks, and therefore covering a greater segment of the circle of twining. Further, as these methods of twining are only used near the starting knots of baskets, these circles are naturally quite small, which further accentuates the overlapping appearance of both these weaves with double warp. These two weaves appear to be used only upon baskets made by women and in all cases have a downward turn of the weaving elements.

As before stated, three-strand twining and three-strand braiding are both used chiefly as border finishes and in the bottoms of baskets. The ordinary form only of each of these two weaves is used as border finish, and it is much more commonly used upon the bottoms of baskets than is the one where the woof strands include four warp sticks. However, none of the three-strand weaves are in very common use, even as border finish or upon the bottoms of baskets. Probably not more than half of the tightly woven twined baskets have borders or bottoms in which one of the three-strand weaves appears. Among openwork baskets on the other hand the bottoms have no special weaves. The borders are of quite a different nature, being in almost all cases of the warp-turned-down order, with now and then a basket of the sifter type possessing a border bound with a hoop.

TWINING.

English	*Northern Pomo*	*Central Pomo*	*Eastern Pomo*
Twining	djama′	tcama′ū, cee′t	kī′cki
Plain twined	bam-tū′c	bam-tū′c	xai-xa′lī, bam-tū′c
Diagonal twined	cūse′t	bam-sa′i	cūsa′s
Lattice twined	t!ī′	hainē′dū	tcīga′, tū′ga
Three strand tw.	cītsī′n	cwi′tki	cūwī′ri
Three strand br.	cītsī′n	cwi′tki	cūwī′ri
Wickerwork	djama′?	itī′t?	dūka′l

Starting Knots.

The Pomo have four general methods of starting the foundations of twined baskets: warp sticks crossed in pairs, warp sticks crossed in threes, warp sticks crossed in fours, and sets of warp sticks bound separately with plain twining and the sets crossed. All the knots formed by these various methods, as well as those used in making coiled baskets, are called by the Northern Pomo būm or sīli′, by the Central Pomo būm or ptsat, and by the Eastern Pomo sīli′x.

Of these various methods, the one in which the warp sticks are crossed in pairs is the one most frequently employed. All plain-twined, openwork baskets, except such long cylindrical fish traps as have no bottoms made of the regular warp sticks used in the sides, and most of the openwork baskets of other weaves are made with this knot. The greater number of closely woven twined baskets are also made with this knot.

There are three methods of manipulation of this particular knot which have thus far been observed. The simplest of these is the one shown in pl. 15, fig. 3, in which the two pairs of warp sticks are crossed without being bound together or wrapped in any way except as they are held together by the regular twining of the weft elements. In a second method the two pairs of sticks are simply crossed and wrapped so that the weft elements pass diagonally across the whole set and through the angles formed by the two pairs of sticks, as in the center of pl. 15, fig. 1. Sometimes also the wrapping fiber passes between the sticks of each pair, thus forming a cross whose arms are parallel to the pairs of sticks, as in pl. 15, fig. 2. The most complicated method, the one most commonly found in use on tightly twined baskets, is the one in which part of the wrapping passes diagonally across through the angles formed by the pairs of sticks, and another part of the wrapping goes across one of the pairs of sticks and parallel to the other pair, as shown in pl. 15, fig. 1. This makes a small square about the diagonal cross of wrapping fiber. It is by this last wrapping that the points of newly inserted sticks are bound, thus making a radial bottom upon which the twining is commenced.

The foundation in which the warp sticks are in sets of three (pl. 15, fig. 6) has so far been found in but few baskets. The wrapping in this case is all done on lines parallel to the one set of sticks and at right angles to the other, thus forming a square of the binding material and holding the sticks of each set closely together and making a very tightly drawn cross of the two sets. In at least some instances of this binding, most of the first few rounds of twining on the bottom of the baskets are of diagonal-twined weave, the remainder of the basket being in lattice twining. In the first round of diagonal twining on such baskets two of the three crossed sticks are bound together between two woof elements, the third, together with a newly inserted warp stick, being included in the next turn of the two-woof strands. This newly inserted warp stick, of course, occupies the angle between the two sets of three warp sticks. The next turn of the woof strands therefore includes two of the other set of three warp sticks, and the next turn again includes the remaining one of the three with another newly inserted warp stick, and so on until the whole round is completed. In some cases the first round of weaving is plain twining, but this is followed by the diagonal twining as above described. Warp sticks crossed in threes may also be used without the above mentioned binding, in which case the twining proceeds as in the case of the warp sticks crossed in pairs shown in pl. 15, fig. 3.

The third method of making the foundation for twined baskets is by means of warp sticks crossed in fours. These sets of warp sticks may be bound at right angles to each other by fibers passing diagonally over the warp sticks and through the angles of the cross formed by these sticks. These fibers may be passed through one or both sets of diagonally opposed angles. The pairs of each four are then bound together with continuous twining fibers, thus serving to further bind the whole eight sticks more securely together. This produces such a foundation as is shown in pl. 15, fig. 5. In addition to this method there is usually another binding in which a single fiber passes at right angles to one set of fours and through the successive spaces between the other set of fours, the rods of which are of course at right angles to the first set and parallel to the direction of this fiber itself. This

gives a binding of three strands of fiber which pass entirely around one set of the fours and parallel to the other set. The appearance is that of very long stitches. As this fiber comes from between the last two of the sticks of the one set of four it passes over the side of the outer one and down on the outside of this set. This may complete the binding, or the same fiber may then be passed in a similar manner between the successive sticks of the other four and thus run at right angles to its former course. Still further binding is sometimes done by passing fibers diagonally across from a pair of one set of fours to the adjacent pair of the other, thus enclosing the two pairs in the same binding. When completed this produces a square the sides of which are at angles of forty-five degrees to the warp sticks. This sort of starting knot may be further complicated by the addition outside of this of another square of binding fiber the sides of which are at right angles to one and parallel to the other set of warp sticks, thus forming angles of forty-five degrees with the sides of the last mentioned square. This same framing of squares about one another while perfectly possible is rarely found in the other knots.

Another method of laying these foundations for twining, related to that just described, is by the use of four sticks in two pairs on the outside of the basket, and a single pair on the inside, as is shown in pl. 15, fig. 4. The outer four sticks are so bound that they appear as separate pairs, while the whole six are bound together with a cross of fibers, and this enclosed in a square of fibers as was described in speaking of the most elaborate of the methods of binding the foundation made of warp sticks crossing in pairs.

As in the case of warp sticks crossed in pairs (pl. 15, fig. 3), the twining upon a foundation of warp sticks crossed in fours may proceed directly without any special binding, though this is rarely found.

The method in which warp sticks are bound together by plain twining and two of these sets of warp sticks are then crossed and bound together with plain or diagonal twining is shown in pl. 15, fig. 9. Sets of four and sets of five of these warp sticks are employed in this manner, though both are of very rare occur-

rence. Thus far they have been found in use only upon open-work baskets of lattice-twined weave.

One other method of starting is employed in making the specialized form of sifting basket shown in pl. 23, fig. 6. Here a short stick about half an inch in diameter is split into several small rods or welts at one end, the other end being left entire. The woof fibers are then twined about these small rods or splints in the same manner as though they were ordinary warp sticks.

Border Finishes.

In twined basketry the Pomo have a number of methods of finishing borders all of which weaves are called by the Northern Pomo tsawa'm, by the Central Pomo m*to't* and tsawa'm and by the Eastern Pomo tsawa'mk. In fact almost all twined baskets have some kind of a border finish which is quite different from the weave of the body of the basket. Now and then, however, a globose twined cooking basket is found which has no special border finish weave, and quite a number of plate-form baskets lack any finishing weave about their borders. One of the characteristic features of Pomo basketry is that in almost all cases, whether the borders are finished with a special weave or not, the ends of the warp sticks are cut off so that they project quite perceptibly above the last course of twining. In most other types of basketry, such as that of the Yurok, Karok and Hupa of Northwestern California these warp sticks are cut off just even with the last course of twining.

In the closely woven baskets of the various twined weaves several of these border finishes are found, but no one appears to be confined to baskets of any particular weave. In some cases the change of weave at the border is quite a simple one. For instance, baskets of lattice twining or diagonal twining are frequently found with simply a few rows of plain twining at the border. In other lattice-twined or diagonal-twined baskets the borders may be finished with a few rows of plain twining and above these one or two rows of three-strand twining or three-strand braiding, and over this again there may be one or more rows of plain twining. Either three-strand twining or three-strand braiding may also be used alone as a border finish.

Diagonal twining is occasionally found as a border finish of lattice or plain twined baskets. Lattice twining on the other hand is almost never found alone as a border finish.

A set of very commonly occurring weaves used as border finish, while essentially the same as plain twining, differs from it in that the twining is upon dual or multiple warp as shown in pl. 15, fig. 8. In these multiple warp weaves the weft elements may include two, three, or four warp sticks about which the twining proceeds in exactly the same manner as though they were single warp sticks instead of groups. In this manner the effect of a set of square or rectangular blocks is produced in the space immediately at the rim of the basket. These blocks are sometimes all of the same color, but usually they are alternately red and white, or black and white, thus producing a row of rectangular figures commonly called by the Pomo here treated, "finishing design." This weave is found occasionally about the border of a cooking or a plate-form basket, and may be at the very rim of the basket or may have above it one or more rows of one of the common weaves. It appears most frequently in those baskets which are bound with hoops.

The baskets bound with hoops are, conical burden baskets, mortar baskets, and occasionally shallow openwork baskets of the sifter type; the last having hoops only when they are of the lattice-twined weave. The hoop is bound on by a process of sewing the same as is used in coiled basketry, the spiral made by the sewing fiber including the uppermost row or two of twining in the basket itself and passing entirely around the hoop. It is so closely bound about the hoop in most cases as to completely hide it. Illustrations of this hoop binding are seen in the plate of burden baskets (pl. 22). The appearance of the inner part of such a hooped rim is shown in the mortar basket illustrated in pl. 23, fig. 4. Just below this hoop in almost all burden baskets there is a row of the above mentioned small squares of plain-twined weave including two, three, or four warp sticks. This row may be immediately below the hoop or it may be separated from it by one or more rows of plain or diagonal twining. It very rarely happens that a basket bound about the rim with such a hoop has not immediately below it a few rows of some weave which is different from that of the remainder of the basket.

Openwork twined baskets have border finishes of two general types. The simplest of these is what may be termed the plain twined bundle warp border. The warp stems are bent sharply over, usually in pairs, and are twined about the succeeding pairs. These stems, as the twining progresses, form two bundles between which are included in each case the succeeding pairs of upright stems. Each pair of these stems is at the same time bent down, joining that bundle of stems which passes to the rear or behind the other bundle, the outer surface of the basket being in view. This gives a simple plain twining of two bundles of warp sticks with no vertical projection of warp above the twined border as shown in pl. 30, fig. 1. It sometimes happens that a basket maker will not use both of each pair of warp stems, but will cut off one, thus reducing the size of each bundle used in twining. This has been noticed for instance in such large openwork granaries as the one shown in pl. 26, fig. 3.

While this same principle of manipulation is involved in the majority of the borders found upon openwork burden baskets and upon flat or hemispherical openwork baskets of the sifter type, many of these differ in having more than one row of twining warp stem bundles, and in having more than two stems in each group. Most have their warp stems gathered in groups of threes and bent into three rows of warp-twining as in pl. 26, figs. 1, 2; but baskets with as many as four rows of twining and four warp stems in each group have also been found. The essential features of all these methods are the same, but in some, for instance the border with three rows of twining and with warp stems grouped in threes, there is considerable variation in the exact manipulation of the stems. Each group of three warp stems is included between the two bundles of twining lowest down. Into this lowest row of twining bundles, however, one of the stems is often incorporated. A second may be taken up in the next row and the third in the top row. This is the most usual though not the universal method. The other methods found are as follows: All three warp stems may be carried up to the second or even to the top row. In the first case the second and third stems are carried up to the top row and usually the second is here incorporated, the third being cut off even with the top or rim of the basket,

though both may be incorporated into the top row of twining bundles. On the other hand it may be that neither is incorporated but both cut off even with the rim. So far no case of a border in which two of the warp sticks are incorporated in the second row of twining bundles has been found. In case all the sticks are carried up to the top row, one only may be incorporated with that row, the other two being cut off, or two may be incorporated into the top row and one cut off. No case of all three being incorporated into the top row has as yet been found. In the instances where the warp stems are carried up to the second or to the top row, the lower rows are formed of bundles of weft stems inserted like the ordinary weft elements in the body of the basket.

Though the most usual method is the one first mentioned, in which one stem disappears into one of the twining bundles in each row, and ordinarily a basket has but the one border arrangement, there are certain cases in which nearly all of the several methods mentioned are found on the same basket. Further there are often placed close together just below the rows of bundles of warp sticks twined about each other, several rows of plain twining as is shown in pl. 30, fig. 1. This on an openwork basket, where the spaces are comparatively large, gives the region about the immediate border a very different appearance from that presented by the remainder of the basket, though in reality there is no different principle of weaving involved.

The second general type of border used on openwork baskets is what may be termed the braided and twined warp border as shown in pl. 30, fig. 2. As seen from the outer surface of the basket, this is a border in which two, three, or four warp sticks are together bent over sharply toward the right and passed in front of or outside the next group of the same number, then inside or behind the following group. As they pass behind this second group they join one of the two bundles of stems which are being twined about these groups of warp sticks, these bundles being simply the bent-over ends of former groups of warp sticks. Having joined the bundle they pass diagonally downward and reappear in front of the next group of warp sticks, this bundle being twined with the other so as to include the successive groups.

Thus by this plain twining of these bundles each disappears behind one group of warp sticks and reappears in front of the next group, giving the appearance of the twining of two large bundles of stems just below the rim of the basket, which itself has the appearance of being bordered with braided groups of warp sticks. In reality this is not a true braiding, though superficially it has the appearance of such a manipulation. This is chiefly used as the border of fish traps such as are shown in pl. 27, figs. 2, 4.

Upon the double fish trap shown in pl. 27, fig. 6, the same general method of manipulation at the border is shown. This border, however, differs from the one just described in that there are really two separate baskets which must be united by this border weave into one. To accomplish this the alternate warp sticks of each basket are cut off at the rim. This being done in both the large outer and the small inner basket, two of each set of our warp sticks are left in each case. The two on the outer larger basket and the corresponding two on the inner smaller one are united and form a set of four sticks which are then manipulated as has just been described.

In both the ordinary twined bundle warp border and the braided and twined warp border there are two methods of disposing of the ends of the warp sticks which remain after the last round of twining is finished. They are usually simply bound down to the edge of the rim of the basket with a willow stem or a piece of string, as is shown in pl. 25, figs. 5, 6, and pl. 26, fig. 3. They may, however, be braided together and the braid bound down in a similar manner, or the braid may be passed down below the lowest row of twining bundles and then passed two or three times in and out among the warp sticks in order to secure it. One notable exception to this careful securing of the ends of the remaining warp sticks to the rim of the basket is found in the double fish trap above referred to. Here these ends are simply bound securely together but are not fastened to the rim itself (pl. 27, fig. 6). At the same point on the basket also the inner and outer parts of it are not attached by having the warp sticks woven into a common border as was above described. On the contrary each has a separate border of bundles of warp

stems twined together, thus leaving a section of the border eight or ten inches in length along which the two parts of the basket are not attached. As elsewhere explained in the present paper, this fish basket is set as a trap in a brush wier built across a stream, and the fish swim into it through the small opening in the center of the inner conical basket. Once within they rarely find their way back through the same small opening. It would also be very difficult, if not quite impossible, for a fisherman to empty the trap through this opening in the center. Emptying the trap is, therefore, provided for by the open section at its border. When the trap is set, the edges of this open section together with the projecting bundle of stems above referred to are bound together to prevent the fish from spreading them apart and escaping. When it is desired to empty the trap this binding is cut and the trap turned bottom upwards so that the fish fall out through the opening at the border.

Another form of border finish used upon openwork baskets, but very rarely met with, is that shown in pl. 30, fig. 3. This may be called a simple turned down warp border. In this border the warp stems are turned sharply over and pass on the outer surface of the basket to the third warp stick on the right. Here the end of the stick which is being turned down is included between the strands of the topmost row of the plain twining of which the whole basket consists. The end of each one of these warp sticks after being bound in this manner is cut off, only a short projection being left on each below this last row of plain twining.

WICKERWORK.

Wickerwork, which has heretofore not been reported from California, is found among the Pomo as the weave of a single kind of basket, the handled seed-beater of the form shown in pl. 24, fig. 1. This is the only occurrence of this weave among the Pomo, but it is almost always employed in making this particular form of basket. Plain twining is however sometimes used in seed-beaters, especially the form shown in pl. 24, fig. 4. This twined seed-beater is made only in the northern part of the territory occupied by the Northern division of the Pomo, and is

apparently due to the influence of contact with Athapascan and Yuki peoples to the north.

COILING.

The Pomo practice two methods of coiling, that upon a single-rod foundation and that upon a three-rod foundation. In point of numbers neither of these methods can be said to predominate, but the finest baskets and those most prized by the Indians are of the three-rod foundation. Feather decoration above mentioned is seldom used in connection with single-rod coiling, but is much used with the three-rod foundation. Coiled basketry is chiefly confined to certain forms: elliptical or so-called boat-shaped, such as is shown in pl. 20 and pl. 19, figs. 4-6; forms approaching more or less closely to globose, examples of which are shown in pl. 18, figs. 3-6; one which may be termed hemispherical, found in the so-called sun basket and in such baskets as the one shown in pl. 19, fig. 3; and a flaring funnel or truncated cone form, such as is shown in pl. 19, figs. 1, 2, and pl. 18, fig. 2.

A coiling on two-rod foundation was reported by certain informants, who stated that only one individual ever made baskets of this sort. Upon finding and questioning the basket maker herself, however, it was found that the idea was original with her and that she had made only two or three baskets of this type, so that so far as the Pomo in general are concerned coiling upon a two-rod foundation does not enter seriously into consideration.

Likewise coiling upon a rod and welt foundation is not a typical Pomo process. This method is practiced only by the Pomo of the Northeastern division and is undoubtedly due to the association of these people with the Yuki to the northwest, where this form of coiling is the typical one. Owing to the small number of survivors of this group opportunity has been afforded of examining but a very few of these baskets. Foundations of three rods and one welt, and foundations of two rods and four welts have been found.

In connection with coiled basketry the method of starting the foundation should be noted. In nearly all baskets where the coiling proceeds in concentric circles, that is, in all coiled basketry except the elliptical or so-called boat-shaped form, the

foundation is begun with a small bundle of sedge or other pliable fibre. The rigidity of the willow stems used as the regular foundation material makes it impossible to bend them so sharply as is necessary for the first few circles of the coiling. To start a basket in this manner the maker simply takes several pieces, say eight inches or so in length, of the flexible fibre, and ties them into a simple knot in the middle. She then begins the coiling of a bundle made by bringing the portions of the fibres lying outside the knot together about it, at the same time wrapping the successive coils with the flexible sedge, bulrush, or other fibre, just as is done in the coiling with willow stems. Having reached the end of this small foundation bundle of flexible fibres, the ends of the first willow stems are trimmed to proper points and inserted, and with these the coiling then proceeds. The laying of the foundation in this manner is the nearest approach to a multiple rod or splint foundation in basketry used by the Pomo, except those of the Northeastern division, who made a rod and welt coil after the manner of the Yuki, as above mentioned. In addition to this method the Pomo also start coiled baskets by means of small twining knots of one of the several forms used in starting regular twined ware. Particularly they use the methods shown in pl. 15, figs. 1, 5, except that each of the rigid rods shown here is replaced by several small sedge or other fibers. They also make a more elaborate knot the outward appearance of which is that of a square composed of a set of four smaller squares. The projecting ends of the pliable fibers are usually manipulated as described above and form a coil, or they may be treated as warp elements and other fibers twined about them in plain or three-strand twining, or in three-strand braiding. This makes a small disc of twining to which the first round of the coil of willow rods is sewed. In very recent years another method of starting these circular bottoms has been used. A disk shell bead is taken and wrapped with fibers, the perforation in its center serving to admit the fibers and produce the same effect as the sewing or wrapping of a coil of fibers or rods. Upon this wrapped bead as a center the rods are coiled in the manner above described.

In starting the coil for a basket of the elliptical or so-called boat-shaped form, on the other hand, no pliable material is

needed. One or four rods of willow, according as to the basket is to have a single or three-rod foundation are cut off the exact length desired for the first coil of the basket, and are laid as the beginning of the foundation. In the case of a single-rod foundation basket the sewing or wrapping of the first coil is done directly upon the single short stick which forms the keel, so to speak. In the case of the three-rod foundation basket of the elliptical form, however, the four short rods selected are ordinarily first wrapped completely with sedge or other flexible fiber to form a compact bundle, and it is upon this bundle of four rods that the first coil of the basket is made, the sewing or wrapping of the coil being done in the same manner as in the case of the single-rod foundation.

The process of this sewing or wrapping of the coils has been described in detail by Professor Mason,[7] but it may here be noted that the basket maker always makes the opening which is to receive the sewing fiber by a thrust of the awl from the outer toward the inner surface of the basket. The sharpened free end of the sewing fiber is then inserted and pulled through to the inside of the basket. It is then pulled very tightly and binds firmly the rods of that particular row of coiling. The insertion of a new sewing fiber is made by passing the end of it under the one or three rods of the coil and drawing the fiber inward toward the inside of the basket until the end is just hidden from view from the outside. The sewing element already in use is then passed for the last time through the coils in the regular way. This element includes all the rods of the coil which is just being added and also one rod of the coil next lower so that as it binds the new and the old coil together it holds the newly inserted element very securely between the two coils. The old sewing element is then cut off just even with the inner surface of the basket, the newly inserted sewing element is taken up, and the coiling and sewing progress as before. The insertions as a result of this process are in many cases scarcely discernible on the inner surface and never so on the outer surface of a basket.

So far as the finishing of Pomo coiled basketry is concerned, the last coil about the opening is made in the same manner as all

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[7] Op. cit., pp. 250-253.

others and shows at this place no new manipulation and no special attempt at ornamentation. It is noteworthy, however, that the ends of the rods in this last coil are in most cases trimmed down in such a manner as to give a tapering effect to the end of the coil, thus avoiding an abrupt ending. The only exception to this is in the case of baskets made by two or three excellent workers, who are able to finish the last coil at the opening in such a manner that it is practically impossible to find where the coil ends. The exact method by which this is accomplished has not yet been determined.

COILING.

English	*Northern*	*Central*	*Eastern*
Coiling	cibū′	cbū′, ctū	kibū′k
Single-rod foundation	tsai, ba′m-tca	tsai, ha′i-tatū	tsai, xa′i-kalī
Three-rod foundation	ba′m-sūbū	kala′l-sībo ha′i-sībo	xa′i-xōmka

In connection with manipulation in Pomo basketry, it should be noted that as one looks at the outer surface of the bottom of a basket, twining always progresses in a clockwise direction, while coiling progresses in a counter clockwise direction. These are apparently the most logical methods of manipulation. Since the actual handling of the pliable fibers in either twining or coiling is done with the right hand, the left hand being employed in holding the rigid elements about which the flexible ones are being twined or coiled. In the case of twining, in which the progression is clockwise, the left hand is free to grasp the basket firmly and to hold in place the two or three warp sticks about which the weft elements have just passed, thus preventing the drawing of these out of alignment by the tension on the weft elements and at the same time not causing the left hand to interfere with the right as would be the case if the progression was counter clockwise or in a direction toward the left hand. Correspondingly, in coiling the fact that the progression is counter clockwise and that the unwrapped foundation sticks consequently project toward the left where the left hand can most easily grasp them firmly and hold them in position at the same time it is holding the basket securely seems to be a logical procedure. However, while these are the directions of progression

found among the Pomo, it must be remembered that they are not the universal ones, but that considerable variation is shown among different peoples, as has been pointed out by Professor A. L. Kroeber in his "Ethnography of the Cahuilla Indians."[8]

FORMS.

Pomo baskets show great variety of form. Among the larger baskets the conical form is found chiefly in burden baskets designed to be carried upon the back by means of a woven net, the weight being supported by a band passing over the forehead. These baskets are made in tightly woven plain twining and diagonal twining, as shown in pl. 22, as well as in openwork plain-twining, shown in pl. 26, figs. 1, 2. One specimen also of a three-strand twined burden basket has been found, but this is very exceptional. Coiled basketry is never made in this form.

The greater number of Pomo burden baskets do not approach so nearly the form of a perfect cone as do the burden baskets of certain other California peoples, for instance the Miwok of the southern Sierra region. There are, to be sure, Pomo burden baskets which are almost perfectly conical, but in most cases the bottom of the basket, that is the point of the cone, is very considerably rounded. Further, one side of the basket is also flattened, this being the side designed to rest on the back. By some informants it is said that this flattening is intentional and that the baskets are woven thus, but by other informants it is said that the flattening comes through use. Inasmuch, however, as in most new baskets this flattening appears, it seems probable that the former explanation is the correct one.

Forms approaching a truncated cone are quite common among the coiled baskets, but do not occur in twined ware. This form may vary from a true truncated cone to forms with very much incurved and others with very bulging sides. In all cases these truncated cones rest upon the smaller end as a base, the upper, larger end being entirely open. Examples of baskets of this general form are shown in pl. 18, fig. 2, and pl. 19, figs. 1, 2.

Hemispherical baskets of several kinds are also found. In this form both coiling and twining are used. Most notable among

[8] Present series, VIII, 49, 50, 1908.

the hemispherical coiled baskets is the three-rod so-called sun basket, which is entirely covered with red feathers and ornamented with bangles of clam and abalone shell. An example of an ordinary three-rod coiled basket of this form is shown in pl. 19, fig. 3. Large open-work baskets of the hemispherical form used for sifting and as general utensils are made in plain twining, lattice twining, and three-strand twining, as shown in pl. 25, figs. 1, 3, 6. Also a small basket used especially for the purpose of sifting acorn meal is made in forms varying between the hemispherical and the plate-form. This basket may be either provided on the bottom with a string loop (pl. 23, fig. 5) which passes around the hand and serves to hold it firmly, or with a small wooden peg (pl. 23, fig. 6), which is grasped between the second and third fingers for the same purpose. This small sifter is most frequently made in plain twining. With this hemispherical form should also probably be classed the mortar or grinding basket, examples of which are shown in pl. 23, figs. 3, 4, though it varies from a true hemisphere to a truncated cone. This basket, used with a pestle for grinding all kinds of vegetable foods, has a large upper opening, bound and strengthened by a heavy wooden hoop, and a smaller opening at the bottom, which rests upon a flat stone.

The most commonly occurring utensil is the basket which may be termed plate-form, shown in pl. 23, figs. 1, 2 and variously known as pan, plaque, etc. It is made in plain, diagonal, and lattice twining, and serves all the useful purposes of a pan among the whites. Baskets of this form range in size from very small to very large, the latter being used chiefly for parching seeds by means of hot coals. Upon rare occasions a coiled basket, usually of single-rod foundation, is made in this plate form, but such are said by the Indians not to have been extensively used in aboriginal times. They are probably patterned after the basketry of the Wintun immediately to the east.

The more or less cylindrical basket, examples of which are shown in pl. 17, figs. 3, 6, and used chiefly for the purpose of cooking acorn mush and other foods, is also very commonly found among the Pomo. Baskets used for this purpose are invariably of the three more commonly occurring twined weaves. Coiled

baskets such as that shown in pl. 18, fig. 6, whic[illegible]n the cylindrical form, are like all other coiled baskets [illegible]ed by the Pomo for purposes of cooking. The Maidu [illegible] Yuki and other California peoples to the south, except [illegible]), use coiled baskets almost exclusively for cooking purposes. The greater number of the large openwork baskets, such as the one shown in pl. 26, fig. 3, and used for the purpose of storing acorns or other foods are also of the cylindrical form, though they sometimes approach the spherical. Smaller openwork baskets, such as the one shown in pl. 25, fig. 2, are used for storing small objects like basket materials, bone awls, etc.

Passing through all gradations of this cylindrical type with its rounded bottom, a spherical form is reached, such as is shown in pl. 16, fig. 3, pl. 17, fig. 4 and pl. 18, fig. 5, in which the only deviation from an almost perfect sphere is the comparatively slight flattening of the bottom necessary to make a surface upon which the basket may rest, and the comparatively small opening at the top. Baskets of this kind are frequently found in plain and diagonal twined weaving, and also in both forms of coiling. The coiled and many of the twined baskets of this type are used for ceremonial or other purposes not strictly governed by utility. The same is true of the spheroidal form (pl. 16, fig. 2, and pl. 18, fig. 1), which with very much flattened top and bottom grades almost imperceptibly into the spherical. The spheroidal form is made in the same weaves as the spherical.

A special form of basket is that resembling the spheroidal, but with a decided narrowing just above the flat base, so that it presents the effect of a spheroid slightly raised from the supporting surface. But very few of these baskets have been seen and these were all in three-rod coiling. The Indians say that this form is not an aboriginal one, but has been made at the request of the whites. The same is true of one or two baskets seen which had a pedestal or foot resembling that of a goblet or cake stand.

Elliptical or so-called boat-shaped baskets, such as those shown in pl. 20, and pl. 19, figs. 4-6, occur in the two methods of coiling and in almost every variation of form, from globes with slightly compressed sides to very narrow and long baskets. In some the opening, always elliptical, is almost as large as the body of the

basket itself, but in most it is much smaller. This particular form of basket, although made quite commonly among the Pomo, is very rarely found elsewhere. They seem to have been used as gifts or, particularly in the case of those of very large size, as ceremonial baskets and as storage baskets for ceremonial and all other important objects, except foods.

Fish-traps, all of which are made by the men in coarse plain-twined weaving, present certain specialized forms. One, illustrated in pl. 27, fig. 3, somewhat resembles a half cylinder. This trap is used in shallow streams for catching small fish. Another, shown in fig. 5 of the same plate is used only in the vicinity of Clear lake, and has the form of a truncated cone with openings at both ends. This trap is used in shallow muddy water. The fisherman grasps the upper or smaller end, and as he wades along plants the trap here and there in the hope of catching the fish unawares. As he feels the fish striking against the side of the trap in its endeavor to swim away, he reaches through the upper small opening and removes the fish with his hand. A third form, shown in fig. 6 of this plate, more or less approaches the conical, but has a small funnel set in the opening. This trap is placed in a wier, so that as the fish swim along in their endeavor to get up or down stream they come upon the funnel and pass in through the small inner opening into the rear of the trap and are unable to find their way out. The fourth form of fish trap, that shown in fig. 2 of this plate, is a long, usually cylindrical, one with flaring mouth, but without a retaining funnel as in the case just mentioned. This trap is also set in a wier in the same manner. In addition to the long cylindrical type mentioned above, some of these traps, such as the one shown in fig. 4, are made in the form of a very long slender cone. Still another trap, resembling in form the long cylindrical fish trap, is the one used for catching quail. It is in from two to five or six sections of six feet or so each. The one here shown (pl. 28, fig. 3) has four sections with a total length of twenty-four feet. The diameter of this trap varies from four to six or seven inches. It is set in a long brush fence, toward which the quail are driven, especially in wet weather. The diameter of the trap is so small that the quail cannot conveniently turn around when once they

have entered. Another trap constructed upon the same principal as that for taking quail is the small woodpecker trap (pl. 27, fig. 1). By binding this trap after dark over the entrance to a woodpecker's nest all the birds are entrapped as they endeavor to come out on the following morning.

Still another basket of hemispherical form, which like the above mentioned hemispherical fish trap is made by the men, is the cradle or baby basket (pl. 24, fig. 2). The child is seated in this cradle and after being thoroughly wrapped is securely bound with the lashings shown in the figure. At the present time the child is wrapped in ordinary cloth but aboriginally finely shredded tule was used for the purpose. The hoop which projects out toward the front serves the double purpose of a handle by which to lift the basket and of a support for a screen to keep off insects and the bright light. From this hoop also dangle various objects which serve to amuse the child, whose arms are tightly bound and who might otherwise become more restless. The broad woven band at the rear of the basket passes over the forehead or chest of the mother and supports the basket upon her back in the same manner as the head band of a burden basket.

One other form of basket found among the Pomo is the seed-beater with a handle (pl. 24, fig. 1). This is usually made in wickerwork, the only basket made in this weave by the Pomo. Wickerwork is of rare occurrence on the Pacific slope and has not heretofore been reported from California. While this is the typical form of Pomo seed-beater there is another made by the Pomo living in the extreme northern part of the territory of the Northern division. As shown in pl. 24, fig. 4, this is quite conical, made in plain twining upon radial warp sticks, and with a handle consisting of a number of sticks inserted in the interstices at intervals from the conical point to the edge along one side of the basket. To these are added the few warp sticks covered by and immediately adjacent to them and the whole bundle is bound with grape vine or other binding material. A notable feature of the handle is the manner of this binding, which consists in all cases of an ordinary wrapping near the base of the handle and then a sort of spiral tying, along the rest of its length. The binding

material passes diagonally from one to the next of the outer sticks of the handle, in each case inclosing a single stick in a simple wrap of the binding material. Sometimes it does not inclose in this manner each one of the outer sticks but only alternate ones. All of the warp sticks except the few covered by and immediately adjacent to the handle are broken off at a distance of half an inch or so from the uppermost row of twining. This gives the basket the appearance of being bordered with a row of projecting points. Such projection of the warp sticks is typical of Pomo twined basketry but in this case it is of unusual length.

FORMS.

English	*Northern*	*Central*	*Eastern*
Basket (generic)	pīka′	ō′nma	ca′di, cat
Conical burden			
Closely woven, pl. 22.	bidji′	ptcī	būgū′
Openwork of peeled rods, pl. 26; 1	bito′i-tsoi, tsoi	īka′l	tso′i
Openwork of unpeeled rods, pl. 26; 2	ha′i-dūkal	tcama′ū	tsoi
Truncated cone, pl. 18; 2, pl. 19; 1, 2	ūyī′l-tō	ctū′-ptci	tīrī′-būgū
Hemispherical, pl. 19; 3	batī′bōom	ctū	
Openwork, sifter type, pl. 25; 3	caka′u-tīu	sa′l-stin	cala′p
Culinary, pl. 25; 4-6	caka′n	sal	
Plate-form, pl. 23; 1	dala′	nasū′	dala′
Plate-form, small, pl. 23; 2	dala′kan	tō′ū	te′ū
Plate-form, sifter, pl. 23; 5-6		sū′kan	
Cylindrical, pl. 17; 3	too′-pīka	ta′kan	
Cylindrical, small	dem	cee′t	
Spherical, pl. 17; 4	pīka′-tcadōl	cee′t-tcibūtcibū	gūmū′Lū
Elliptical or boat-shaped, pls. 20, and 19; 4-6	cilō′	kala′cūna	xala′cūna
Cylindrical fish trap, pl. 27; 2, 4	ka′kōi	ba′iya-hakō	xa′xōi
Conical fish trap, pl. 27; 6	būka′l	ha′kō	būxa′l
Truncated cone fish trap, pl. 27; 5		ca′-mtce	ca′-mīdje
Half-cylinder fish trap, pl. 27; 3		tsada′t	tsada′r
Quail trap, pl. 28, fig. 3	caka′ga-hakōi	caka′ga-hakōī	cag‘a′x-hakōi
Handled seed-beater, pl. 24; 1	batū′	batū′	batō′
Open-work storage, pl. 26; 3	pase′	itī′t	dīti′r

English	*Northern*	*Central*	*Eastern*
Openwork storage, small		tso'i	bitsū'l
Mortar, pl. 29; 3, 4	mīdje'	mtce	mīdje'
Cradle, pl. 24; 2	sīka'		xa'i-katōli
Feathered basket (any form)	ta'-pīka, ī'pīka	ta'-stōl	ta'-sītōl yīī'-cat

ORNAMENTATION.

The ornamentation of Pomo basketry may be placed under two general heads, the first comprising all designs and patterns worked into the basket proper by the use of different kinds and colors of fibrous materials, the second comprising what may be termed auxiliary ornamentation or the various forms of decoration produced by means of feathers, beads, and bits of abalone shell. The subject of auxiliary ornamentation has already been spoken of under the head of basket materials, where, in connection with the sources of the various feather and shell materials, their use upon baskets of certain forms and devoted to certain uses, and the general method of their manipulation have been treated. In passing, however, it should also be mentioned that in a great measure, except where the surface of the basket is entirely covered with feathers, no attempt is made to work out a pattern in the feathers themselves, their use being chiefly secondary to the pattern worked out in the fibre. Often the red feathers of the redheaded woodpecker are scattered at frequent intervals over the white part, or what may be considered the groundwork of the basket; they thus outline and bring more prominently to notice the pattern which is worked out in black, or sometimes red, fibre material. At other times these or other feathers are scattered in this manner over the entire surface of the basket regardless of the pattern. However, where the surface is thickly covered with feathers the designs which are worked out in the feathers are of course the same as the designs in the fiber materials of the baskets, although on account of the nature of the feathers it seems impossible to make other than simple patterns. At any rate the more difficult pattern are never found.

Pomo baskets, as before mentioned, are made of fiber materials in three colors, white, black, and red. It is almost invariably the case that the white material is used as a background

or surface upon which to work out a pattern in black or red. A few cases, however, have been found where the portion of the pattern made in the white material, instead of that in the colored material, was named by the informant. In all such cases the white was as much or more conspicuous than the colored, as for instance in a case of diagonal zigzags in which the white and black or red zigzag lines alternated. No instances have as yet been found among the Pomo of baskets with backgrounds of a colored fiber and with a comparatively small pattern in white, as is quite often the case among the Yuki immediately north of the Pomo.

DESIGN ARRANGEMENT.

One of the noteworthy features of Pomo basketry is the fact that designs are arranged in several ways, instead of in only one or two as is the case with most California peoples. The two principal methods of arrangement are the horizontal one, in which the design is arranged in a band or circle about the basket, and the diagonal one, which on account of the curved surface of the basket gives the appearance of a spiral. Instances of these are shown in pl. 16, figs. 4 and 2 respectively. Less frequently occurring arrangements are what may be termed the vertical, in which designs are placed vertically, and the individual, without any apparent reference to other figures upon the basket. Examples of these arrangements are shown respectively in pl. 18, fig. 5, and in the first four figures of pl. 29. Still another method of arrangement, the crossing, which should really be considered as an amplification of the diagonal, is shown in pl. 17, fig. 6, and in pl. 28, fig. 1. Closely related to this is the arrangement shown in pl. 16, fig. 6, and pl. 22, fig. 4, where the pattern, in both these cases of large triangular figures, is so arranged that the corners of each touch corners of those nearest in such a manner that the rows of figures appear either as diagonal and parallel or as crossing. This arrangement might also be considered as superimposed horizontal rows of figures. Very elaborate and effective patterns are produced in this manner.

In connection with this matter of design arrangement it is notable that certain of them are not only much more frequent

than others, but also that the proportions in which these different arrangements appear vary considerably, according to the technique. The following table, based upon one hundred and twenty-three twined and one hundred and forty-three coiled baskets, shows the approximate per cents of the various methods of design arangement in twining and coiling respectively.

	Horiz.	Diag.	Crossing	Vertical	Individ.
Twined	70	25	5	0	0
Coiled	40	30	10	15	5

The horizontal or banded arrangement prevails in both twined and coiled basketry, being that found on a large per cent of the former and on the latter in a smaller though very considerable per cent. This arrangement is particularly noticeable on burden, and cylindrical or spherical cooking baskets, both of which are made only in the twined weaves. Practically equal per cents of diagonal patterns are found in twining and coiling, and small per cents only of crossing patterns are found in both. No vertical or individual arrangements appear in twined basketry, and they are rarely met with in coiling. Thus it appears that Pomo basketry is characterized in the matter of its design arrangement particularly by the horizontal and diagonal methods.

As regards the single and three-rod foundations of coiled basketry no particular arrangement of the patterns predominates, but in twining certain arrangements are more frequent on baskets of a particular weave than upon others. Upon plain and upon lattice twined baskets the arrangement is almost wholly horizontal. Upon diagonal-twined it is largely diagonal, with a small per cent. of crossing. A few have patterns covering the entire surface of the basket. The horizontal arrangement only is found upon baskets of the three-strand twined weaves.

In connection with their designs, particularly the horizontal ones, the Pomo seem to have had the rather unusual custom of purposely leaving a break or opening in the pattern, and it is almost, if not quite, impossible to find a basket with its patterns arranged in horizontal bands in which they all run continuously around the entire basket. There is almost always in one of the bands, and usually in all of them, a larger or smaller opening somewhere about it. In some cases these openings are very small

indeed, being marked by but a slight difference in a few stitches, while at other times they are broad and filled with an elaborate pattern of a kind entirely different from the general one to either side. Instances of such openings are shown in pl. 17, fig. 3, and pl. 23, figs. 1, 3, 5. This break is called by the Northern Pomo daū and hamaka'm, by the Central Pomo ha'mda and ham, and by the Eastern Pomo hwa. That this opening is not left by accident is shown from the fact that many baskets have bands of designs which, had they been completed entirely of the same figures, would have made perfect patterns. Further, the Indians themselves maintain that these breaks are left in the design on account of their belief that the maker of a basket without such a break will become blind. They also say that the first people were instructed by Coyote, the culture hero, to leave such breaks and that the instruction has rarely been forgotten or disregarded. They even give legendary accounts of women who have in times past neglected to leave such openings in their patterns and who have actually paid the penalty of blindness. Such accounts and explanations from the Indians must of course be taken as effect rather than cause in considering the probable origin of this custom. There is reason to believe that the true origin of the dau is in technique and that the explanations now given by the Indians accounting for its existence are entirely secondary. Having once originated, however, such explanations would tend to more firmly fix the custom, and to cause the dau to appear where it might otherwise be omitted.

Upon some baskets whose patterns are arranged spirally there appear small odd designs between the spirals or within one of the large elements of one of them. Some informants give the same names to these as to the breaks in the banded patterns. Others, however, recognize no connection between the two. A basket upon which both of these occur is shown in pl. 16, fig. 5.

Short pieces of the quill of the yellowhammer or red-shafted flicker are found in many baskets at one or more points over the surface. The insertion of these is also connected with the idea of blindness and general ill-luck. They are placed in the basket by a woman upon the approach of a menstrual period if for any reason she does not wish to cease work upon the basket. Tradi-

tional belief requires that a basket maker cease all such work as well as observe many other restrictions in the matter of eating, handling certain objects, etc., at such a time. If, however, she wishes to continue the work upon a basket this may be done, provided first a few stitches of the quill of the yellowhammer be inserted in the basket at the point where she is at work. In the majority of cases, however, a menstruating woman ceases all such work, which accounts for the fact that not all baskets show the small pieces of quill, and that very few baskets show more than one or two of them.

ELEMENTAL DESIGNS.

In considering the subject of Pomo designs and design names a very sharp distinction must be made between a design element or simple elemental figure, and a pattern or complex figure composed sometimes of a single design element repeated, and sometimes of two or more of these simple elemental figures combined to form a complex whole. An example of the former may be seen in fig. 1 or fig. 127, while examples of the latter may be seen in figs. 55, 34, 36, etc. In naming designs and patterns the Pomo themselves make just such distinctions, with the result that their names may be conveniently arranged under the two heads: names of design elements, and names of patterns. The former are simple names of well known natural or artificial objects, geometric figures, and the like; while for a combination of these simple elemental figures to form a complex pattern they give a name which is more of a descriptive sentence or phrase-name than a simple word, since it gives the principal, at least, of the constituent elements and mentions the relation in which they stand one to another. Of course there is a certain variability in the names given to the same design element by different informants, and still more is this true of the names given to the complex patterns. To a large extent, however, what appears a considerable variation in names is found upon investigation to correspond to the differences of dialect, so that within any one dialectic group the naming of elements and patterns is fairly uniform with all informants, though, as would be expected, there are variations among individuals of the same group.

Triangular Elements.

The most frequently occurring design element is the *arrowhead,* called by the Northern Pomo katca′k, by the Central Pomo katca′, and by the Eastern Pomo kaga′ or xaga′. The arrowhead design is at all times a triangle, though the exact form of the triangle varies greatly. While triangles of other forms are sometimes used the isosceles triangle predominates. The majority of these have the angle at the apex 90 degrees. Figures 1 to 63 show the various forms of triangles and also a few of the many combinations of triangles with triangles and of triangles with other figures. To almost all of these triangular figures the name arrowhead is given, though a few, which will be noted below, are more often called by other names. Several of these other designations, such as sharp points, etc., apparently carry to the Indian mind the same general idea as arrowhead.

The design shown in fig. 1, a band of isosceles right triangles, placed at comparatively great distances from each other, was called by some Northern Pomo informants dīta′ska, *spotted,* though by another informant it was named dita′s tcidī′yemūl, *spot tcidī′yemūl,* and by still another datī′pka, *sharp points.* Central Pomo informants gave in most cases katca′-dalaū, *arrowhead-half.* Katca′-mtil tciltaū, *arrowhead-slender stuck-on,* was also given. Eastern informants gave kaga′, *arrowhead,* and kaca′icai kūdja, *butterfly small.* Triangles arranged with such wide spacing are of rare occurrence, but two cases being thus far noted.

1

A single case of pairs of isosceles right triangles arranged in a band about a basket, in the manner shown in fig. 2, was found. The Northern and Eastern informants gave the unqualified name *arrowhead* to this design; but Central informants differed, one calling it *arrowhead,* another *arrowhead-half,* katca′-dalaū, and a third *arrowhead-half stuck-on,* katca-dalaū tcī′ltaū.

2

Bands of design made up of isosceles right triangles arranged with short intervals between their bases and with their apexes

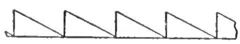
pointing downward, as is shown in fig. 3, occasionally occur. In all three of the Pomo divisions these are called *arrowhead*. In the Northern they were also called by one informant *butterfly*, kaca'icai, and by another *turtle-back*, kawī'na-tcīdik. By other informants they were called *pine-tree design*, kawa'ca datoī. By Central Pomo informants they were also called *arrowhead-half*, katca'-dalaū, and *turtle-neck*, kawī'na-ūtca. By those of the Eastern dialect they were also called *arrowhead-half*, kaga'-daLaū, as well as *butterfly*, kaca'icai. This design is of but rare occurrence.

3

4

5

Bands of isosceles right triangles arranged with their bases touching each other and either with their apexes pointing up or pointing down, as in figs. 4 and 5, are sometimes found. These are called by the Northern Pomo, in addition to the common term *arrowhead*, which is however not often applied to these particular figures, *butterfly*, kaca'icai, and *large spots*, dapo'kka. One Central informant gave these designs the name *turtle-neck*, kawīn'a-ūtca, at the same time, however, stating that the design was unfinished. Eastern informants called this design *butterfly*, kaca'icai.



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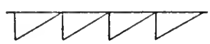

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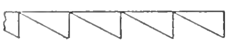

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9

In figs. 6, 7, 8 and 9 four different arrangements of an ordinary right triangle are shown. By Northern Pomo informants these figures were called *design pointed*, datoī ditī'pka. By in-

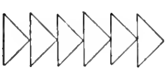
formants speaking the Central dialect they were called *arrowhead-sharp*, katca'-mset, though by another informant figs. 6, 7, and 8 were called *zigzag-half*, tsīyo'tsīyo-balaū, fig. 9 being called by her *arrowhead-half band*, katca'-dalaū *etot*. By Eastern informants these figures were called kaga'-dīset, kaga signifying *arrowhead* and dīse't meaning any objects, *whether pointed or otherwise, which project or stick up*. They were also called *arrowhead-half*, kaga'-daLaū, and *arrowhead sharp*, kaga'-mīset. Designs made of these figures are very rarely met with.


10


11

One instance, fig. 10, was noted of right triangles similar to those above mentioned but arranged in a double instead of a single row. Two Northern Pomo informants gave the name datoī dītī'pka tcacītemūl, *design pointed, going-around and meeting (plural)*. According to a Central informant it is called katca'-dalaū *etot*, *arrowhead-half band*. Eastern informants differ between xaga' kama, *arrowhead mark*, and kaca'icai, *butterfly*.

One case of these right triangles at considerable distances from one another was also found, but in this case the triangles are combined with another element so that their bases rest upon a line. This design is shown in fig. 11. Northern informants call it katca'k datsai-banem, *arrowhead broadband* (literally broad placed or put on). One Central informant gave the name *arrowhead-sharp*, katca'-mset, to this design, while another called it *eye-half (plural)*, ū'ī-balaū-ai. No name was obtained for it in the Eastern dialect.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13


14

Occurring very rarely are such designs as those shown in figs. 12 and 13, in which the apex of each isosceles triangle touches the middle of the base of the triangle next to the right or to the

left according as the design points toward the one direction or the other. Designs such as these, whether arranged horizontally, as here, or vertically, as in figs. 14, 15 and 16, usually bear the name *turtle-back* or *turtle-neck.* All these five designs are called by the Northern Pomo kawī'na-tcīdik or kawī'na-kū, *turtle-back* or *turtle-neck*, the former being more often used. Among the Central and Eastern Pomo they are called *turtle-neck*, kawī'na-ūtca and kana'dīhwa-koī respectively. There are however informants who give these figures different names. Fig. 12 was called by two Northern informants bice-yee nat datoī, *deer-breast nat design.* Fig. 13 was called by the same informants datoī datīpka tcacdīmūl, *design sharp-points, going around and meeting (singular).* Figs. 14 and 15 were called by them also kawa'ca datoī, *pine-tree design,* while they gave as other names for fig. 15 bice-yee nat, *deer-breast nat,* and datīpka ū'yūl dana daienka, *sharp-points upward rub (?) placed close together in a row.* Correspondingly for fig. 16 they gave yo'wil dana datīpka, *downward rub (?) sharp-points.* One Eastern informant called the design of fig. 14 xaga'-miLau, *arrowhead split-open.* For the design of fig. 15 the same informant gave on one occasion *butterfly*, kaca'icai, while another mentioned xaitsa'k kama. Xaitsa'k may be approximately translated as *stretcher*, since in its use it most nearly resembled a stretcher for carrying the wounded. It was made of green limbs woven together and was used for transporting an invalid or anyone who might have been injured, for instance, while hunting.

15

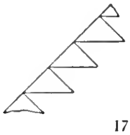
Figure 16 shows one of the very few hollow figures used on Pomo basketry. Practically all the remaining figures are what may be called solid or filled figures. The design shown in this particular figure has been found so far on but a very few baskets. While it is ordinarily given the same name as the similar figures just mentioned, it is worthy of note that it also has other names. For instance the Central Pomo call it peē'-meō kawī'na-ūtca, *deer-back turtle-neck.* Among the Eastern Pomo it was called by one informant

16

tū'ntūn wīnalīhempke, *ants crossing*, by another bū'-dilē wīnalīhempke, *potato-forehead crossing*. By potato is meant what is called "Indian potatoes," the bulbs, tubers and corms of the many species of bulbous and tubrous rooted plants which grow in the Pomo country. Exactly what is meant by potato-forehead is not certain, for the Indians themselves differ in their explanations of the term. Some say it refers to a protuberance on the upper surface of a corm and of some bulbs also, while others maintain that it refers to a protuberance on the bottom instead of on the top. In the schematic design shown in figure 16 the reason for these various names is not apparent.

The nature of the surface upon which this design must be worked, the basket being built up as it is of consecutive coils, renders it impossible to make a perfectly straight slanting line. The best means therefore of making a slanting line is to make a succession of small squares or rectangles, each coming in a little nearer toward the apex of the triangle than the one below. If these squares or rectangles are of fair size they are called by the Central Pomo deer-back, and by the Eastern Pomo potato-forehead. If they are very small they are called ants by both, thus accounting for the variation in the name of the design shown in this particular figure. In the case of the Central dialect name mentioned above, it is interesting to note that two names have been combined. Deer-back turtle-neck names the small figures of which the larger figure is composed and also the large figure as a whole. The term wīna'līhempke, *crossing*, used by the Eastern Pomo refers of course to the convergence of these lines of small squares or rectangles. The designs of figs. 12 and 13 have so far been found in but one instance each. That of fig. 14 has been found twice, that of fig. 15 eight times, and that of fig. 16 four times.

Isosceles right triangles arranged diagonally, as shown in figs. 17, 18, 19, and 20, are found frequently. Only the design shown in fig. 20 is found alone as a distinct pattern. The designs in all four of these figures are, however, very frequently met with in combinations of elaborate patterns. In fact the most elaborate pat-



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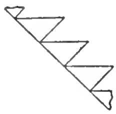
terns of all those found in Pomo basketry have these as their chief elements. Looking from the bottom toward the rim of a basket nearly all spiral designs progress toward the left. Therefore the most complex spiral patterns having any of the designs represented in these four figures as their chief elements have those shown in figs. 18 and 20 upon the upper and lower side of the spiral respectively. Arranged between these two principal elements, which are in almost all cases of comparatively large size, may be almost any other element or combination of elements. Such a complex pattern is shown in fig. 55, where a zigzag element is placed between the two triangle elements. Only one case has so far been found of an ordinary spiral pattern having the elements represented in figs. 17 and 19 as components, this being the only case of an ordinary spiral progressing upward toward the right instead of toward the left. The designs shown in these two figures do, however, have considerable use in such complex crossing patterns as those in pl. 19, fig. 3, and pl. 17, fig. 6. Patterns of this kind are composed of two spiral designs, one progressing upward toward the left in the ordinary manner, the other progressing upward toward the right, thus causing them to cross each other. All four of the designs shown in these figures find still another use, namely, in what may be termed edging or bordering the large triangles of one of these spiral patterns. Such a bordering, employing the designs shown in figs. 17 and 19, is found in the complex pattern of fig. 55. In addition to these uses, one of the pairs of the four is sometimes employed as the center of a complex spiral pattern. Such a center is shown in fig. 56, in which the designs of figs. 18 and 20 are found. In a separate pattern, such as is shown in fig. 56, these elements are but rarely found. It is occasionally used however as the one filling the central spaces between the large diagonal rows of triangles, as is done by the zigzag in fig. 55. All these designs whether they are used as the primary elements in a complex pattern, or as the secondary elements in such a pattern, are called *arrow-*



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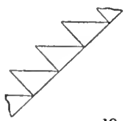
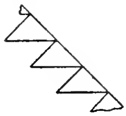


19

head by the Pomo of all three divisions under consideration, though of course there are certain differences in naming them.

Used singly as the entire pattern of a basket the design shown in fig. 20 is usually called by the Central and Eastern Pomo *arrowhead-half*, katca'-dalaū and kaga'-daLaū respectively. By Northern informants it was called datō'ī kata daienga, *design empty placed-close-together-in-a-row*. When used as the principal elements of a complex pattern the designs shown in figs. 17 and 20 are called by Central dialect informants *inward-arrowhead*, tca'l-katca, while those represented in figs. 18 and 19 are called by the same informants *outward-arrowhead*, ko'l-katca. The explanation obtained from them for these names was that in weaving such a design as that in fig. 17 or 20, where the apexes of the triangles point upward, each triangle is made successively shorter and shorter rows of fiber. Thus the work constantly progresses inward to the apex of the triangle. In the other designs, shown in figs. 18 and 19, where the apexes of the triangles point downward, the operation is reversed and each triangle is made up of a succession of rows ever increasing in length, thus progressing constantly outward from the apex to the base of the triangle. Such a distinction was not made by informants of the other two Pomo divisions, these designs being usually called by those of the Eastern dialect *arrowhead-half*, kaga'-daLaū, or in some cases *butterfly*, xaca'icai. By the questioned informants of the Northern dialect they were called in most cases datō'ī kata, *design empty*, or simply *arrowhead*, katca'k. The same names were also given to these designs when they appeared as secondary or auxiliary (figs. 55, 56) to the larger spirals or triangles.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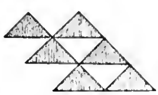
As above stated, right triangles arranged as is shown in fig. 20 are occasionally used as the pattern of an entire basket, but only one case of a double row of these triangles, such as is shown in fig. 21, has been been found. This design was called by two Northern Pomo informants datō'ī kata ūyūl daienga, *design empty upward placed-close-together-in-a-row*. By Central informants it was called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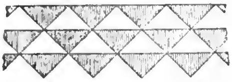
arrowhead, katca′, and also *arrowhead slender,* katca′-mtil. By Eastern informants it was called *butterfly,* xaca′icai.



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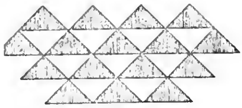

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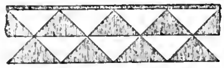

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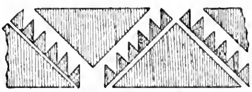
Similar to the above mentioned arrangements of isosceles right triangles are found such patterns as those in figs. 22, 23, and 24. When the design shown in fig. 20 is used as the entire design of a basket it differs from these in that each diagonal row of isosceles right triangles is distinct and separate from the remaining rows, whereas in these cases each triangle touches at its three corners its neighbors. Thus they may be either considered as arranged horizontally or as arranged diagonally. These patterns are found arranged in bands or circles about the surface of a basket and vary from two to as many as four triangles in width. As shown in these figures the apexes may point either up or down, and they may be accompanied by a heavy bordering line, as is shown in fig. 24. These patterns are called by the Northern and Eastern Pomo *butterfly,* kaca′icai and xaca′icai respectively, while Central informants always called them *arrowhead-half,* katca′-dalaū. By one or two Northern informants these patterns were also called datō′ī kata, *design empty.* What is in reality the same as these patterns except that the triangular figures cover the entire surface of the basket instead of being arranged in bands is shown in pl. 16, fig. 6. This pattern occurs occasionally and, if unaccompanied by other elements, is called by the same names as the banded triangular patterns above mentioned.

One of the most frequently occurring arrangements of these isosceles right triangles is that shown in fig. 25. It rarely happens that a simple pattern exactly like that of this figure is found, but the great majority of banded or circular patterns are formed upon this as a base. All sorts of other design elements are combined to make the complete elaborate pattern. A noteworthy feature of

25

all patterns founded upon this as a base is that the apex of each triangle is so placed that if moved upward it would just fit the space between the two triangles above. No case has yet been noted in which the apexes of the opposing triangles were placed opposite each other. These large triangles, which form what may be termed the primary elements of the pattern, may be arranged as in fig. 25 with more or less space between their bases, or they may be so arranged that the points of their bases touch the adjacent triangles. The former is the more usual arrangement, however. As in the case of the main elements of the diagonal patterns of triangles, Central Pomo informants seemed to differentiate more sharply between these elements than did those of the Northern or Eastern Pomo divisions. By Northern informants both the upper and the lower triangles were usually called datō'ī kata, *design empty*, and by the Eastern Pomo *butterfly*, xaca'icai, or *arrowhead*, xaga'. Central informants, however, named separately the two sets of triangles, those in the lower row being called yō'-katca, *lower-arrowhead*, and those in the upper row ū'yū-katca, *above or upper-arrowhead.*



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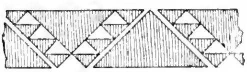

27

There are many combinations of these design elements with others. Three examples are shown in figs. 26, 27 and 28. The first is called by Northern informants datō'ī kata dilē kateak daienga, *design empty in-the-middle arrowheads placed-close-together-in-a-row*, the second datō'ī kata xōl-*t*ū, datīpka, *design empty on-both-sides sharp-points.* By Central informants such an exact distinction is not made, the first being called by them katca'-dalaū lēLan, *arrowhead-half in-the-center,* katca'-mset *ctot, arrowhead-sharp band*, or katca'-mtil *ctot, arrowhead slender band*, while the second was called katca'-dalaū *ctot, arrowhead-half band,* or kaca'icai *ctot, butterfly-band.* By Eastern informants the first was called xaca'icai dilē gaiya xaga dzīyō'dzīyō, *butterfly in-the-middle gaiya arrowhead zigzag* or simply xaga'-mīset, *arrowhead-sharp,* or dzīyō'dzīyō dīset, *zigzag projecting.*

The pattern of fig. 27 was called xaea'icai winalīhempke kalūtū-duk kōldaiyaūhmak, *butterfly crossing striped-watersnake meet-together* or simply xaga'-daLaū, *arrowhead-half*, or xaea'icai-diset, *butterfly-projecting*. The design of

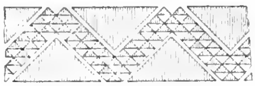
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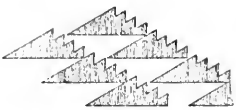
fig. 28 is the same as that of fig. 27, except that the central design element consists of a double instead of a single row of small triangles which point up instead of down.

A pattern composed of large triangles combined with smaller ones but quite different in form from those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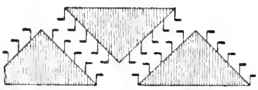
just discussed is shown in fig. 29. Here the smaller triangles used to border the larger ones are made an integral part of them so that each large triangle appears to have one smooth and one serrated side.

Other examples of such combinations are shown in figs. 30 and 31. In the former the band of large triangular figures is combined with the conventionalized design named after the club-shaped plume from the crest of the California quail. By the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31

Northern Pomo this pattern is called datō'ī kata xōltū cakaga-kēya daien, *design empty on-both-sides quail-plumes collected.* A similar descriptive, though shorter, name was given by Eastern informants, who called this pattern xaea'icai hna caga'-xe, *butterfly and (or with) quail-plumes.* By all informants of the Central dialect this pattern was simply called *quail-plume band*, caka'ga-kēya *ctot*. In fig. 31 a rather unusual combination of triangles is shown. In fact this has thus far been found on but one basket. Information concerning it is lacking from the Northern and Eastern Pomo, but it was called by Central informants katca'-dalaū *ctot* lala tsīyō'tsīyō tcūwan, *arrowhead-half band in-the-middle zigzag stripe.* In this name curiously enough no mention is made of the smaller inner triangles themselves, only the white zigzag between these small triangles being noted.

Similar to these designs, yet different in that they lack the upper row of triangles placed with their apexes downward, are the patterns represented in figs. 32, 33, 34 and 35. Concerning the first no information was obtained from Northern or Eastern


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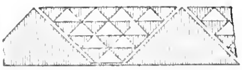
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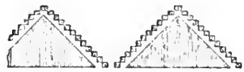
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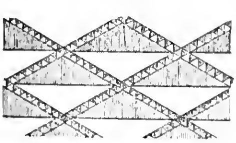
informants. Central informants, however, gave the name katca′-dalaū katca-mset slema tcūwan, *arrowhead-half arrowhead-sharp string stripe*. Thus are named not only the large triangles and the small ones bordering them, but also the white space between the two which to the Indian mind forms a line called string. The second of these patterns was called by Northern informants datō′ī kata xōltū datī′pka, *design empty both-sides sharp-points*. By Central informants it was called katca′-dalaū *etot*, *arrowhead-half band*, and also kaca′icai *etot*, *butterfly band*. By Eastern informants the name xaca′icai xaga′-daLaū, *butterfly arrowhead-half*, was given, the name butterfly being applied to the large triangles, arrowhead-half to the smaller ones. The pattern of fig. 34 is composed of two distinct elements, the large triangle called by the Northern, Central, and Eastern Pomo respectively, *empty*, *arrowhead*, and *butterfly*, and the lines of small rectangular figures along their sides. These last are variously called, according to their size, *ant* and *deer-back* by the Northern and Central Pomo, and *ant* and *potato-forehead* by the Eastern Pomo.

In figs. 35, 36, and 37 are shown typical examples of combinations of the isosceles right triangle with other elements, but in these cases the primary arrangement is that shown in fig. 23. Occasionally these figures occur in bands of from two to four of these large triangles in width, but more often they cover the entire surface of a basket as is shown in pl. 22, fig. 4, and pl. 16, fig. 6. In fig. 35 is seen a rather unusual arrangement of the secondary triangular figures. They are here so placed that one point of the base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touches the side of the large triangle instead of sides of the small and large triangles being parallel to each other. The names obtained for this pattern from Northern informants were datō'ī kata mina kateak, *design empty over (or upon) arrowhead,* and katca'k datōī daten, *arrowhead design passing-along (plural).* By Central informants it was called katca'-dalaū u'ī-balaū kōwal-dakadētan, *arrowhead-half eye-half following-on-the outside (plural).* Also the name katca-dalaū malada tcūwan, *arrowhead-half near stripe* was obtained. By informants of the Eastern dialect it was called biccē'-tō kama dilē dai gadil, *deer-stand-in mark arrowhead in-the-middle along running along (plural).*

In fig. 36 a combination of these large triangles with small rectangular figures along their borders is shown. This pattern is called by Northern informants datō'ī kata xōl-*t*ū biccē'-maō bitcūtcai, *design empty on-both-sides deer-back small (plural).* The word small is here introduced for the reason that the row of rectangles to be called deer-back must be considerably larger than the very small ones called ants. These seem, according to the informant's notions, to have been part way between the two. Central informants gave the name katca'-dalaū pcē'-mcō malada kaden, *arrow-head-half, deer-back near follow-up.* Eastern informants gave the name bū-dilē xaga ko'nawa gadil, *potato-forehead arrowhead on-both-sides passing-along (plural).* By some the design was called merely *butterfly,* xaca'icai.

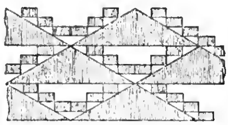

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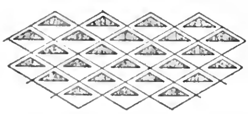
Fig. 37 represents a pattern which covers the entire surface of a large burden basket. No name was obtained for this pattern among either the Northern or Eastern Pomo but Central informants gave katca'-dalaū malada slema tcūwan, *arrowhead-half near string stripe.* The element called string in this case is not, as in the pattern represented in fig. 32, the white line adjacent to the large triangle, but the black line at a little distance.



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Figs. 38 and 39 show a pattern which is met with occasionally, not only as in fig. 37, which if resolved into the smallest possible elements will be seen to be the same as 39, but also as

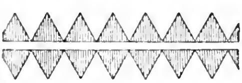
parts of other patterns and even occasionally as individual figures such as are shown here. No special name seems to have been given to this design by the Northern Pomo. The only informants questioned gave such general names as datō'ī katse datsūtka, *design black datsūtka*, and datoi datapka, *design large-area*. Among the Central and Eastern Pomo, however, special significance was attached to the lines bordering the triangle in each case. By the former the entire design was called katca'-dalaū tū ka'mtiltalī-uī-

38

39

kū wī, *arrowhead-half side killdeer-eyebrow*. The explanation given by one informant was that the narrow line along the side of the triangle represented the narrow line above the eye of the killdeer. By Eastern informants designs of this kind were called xaca'icai tsawal-mīsak, *butterfly sunfish-rib*. Here, as in other instances, the change of the name of the large isosceles right triangle from arrowhead among the Northern and Central Pomo to butterfly among the Eastern is noteworthy. The angular line about the triangle is the element called sunfish-rib. The regular sunfish-rib design is seen in fig. 225. These designs were, however, called by one informant kalū'tūduk xacaicai, *striped-watersnake butterfly*. The fact that the lines about the triangle in this case meet in an angle was evidently neglected by this informant, who gave them the name commonly applied to any straight line, such for instance as is shown in fig. 122 or 127.

A very few instances have been noted of a pattern such as is seen in fig. 40. By a Northern informant this pattern was called simply *design sharp*, datoi ditī'p. By Central and Eastern informants more descriptive names were given. By the former it was called tsīyō'tsīyō lala kalū'tcū-wak, *zigzag in-the-middle blank stripe*, and by the latter xaga'-datīp dilē kalū'tūduk, *arrowhead-sharp-point in-the-middle striped-watersnake*. It will be noted that in the former case the entire pattern is conceived as a zigzag the same



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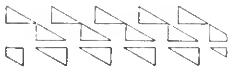
as though no break occurred through its middle, while in the latter the two halves of the pattern are thought of as separated, sharp pointed arrowheads. Here also the white stripe in the middle is considered by the Central informant not as the striped-watersnake element, but simply as a white or blank stripe. In the majority of cases all informants named only the colored portion of a design, and consequently the term striped-watersnake is most often applied to a straight colored line. This applies to the informants of all three dialectic divisions. Also the white stripe or line such as is shown here is sometimes named striped-watersnake not only by Eastern informants, as in this case, but by others as well.



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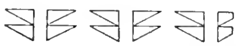

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A single instance was found of the rather peculiar combination of triangular elements such as are shown in fig. 41. Northern informants spoke of this pattern simply as *pointed broad-band,* ditī'pka datsai-banem. A Central informant called it tsīyō'tīyō balaū-ai ctot, *zigzag half (plural) band.* No interpretation was obtained for it among the Eastern Pomo.

Only one instance has been found of the design shown in fig. 42. Northern informants called this datīpka dilē datapka, *sharp points in-the-middle large-area,* by which it is evidently intended to note the wide white stripe through the middle of what would otherwise be a completed figure consisting of two large superimposed isosceles triangles. By Central informants this pattern was called simply *turtle-neck,* kawī'na-ūtca. By one informant also it was spoken of as simply *arrowhead,* thus in both names no mention is made of the white stripe in the middle. Eastern informants called it xaLū xo'nawa xaga gadil kama, *blank on-both-sides arrowheads passing-along (plural) mark.*

The following twelve figs., 43-54, except 53, have to do with triangles whose apexes are acute angles. Figs. 43 and 44 show a design element which occurs occasionally and which is called by Northern informants *arrowhead-sharp,* katca'-miset, or *arrow-*

head sharp-points, katca kase'tka. Central informants called it both *arrowhead-sharp* and *arrowhead-slender,* katca'-mset and katca'-mtil. By one of the same informants it was, however, upon one occasion called *zigzag-half,* tsīyōtsīyō-balaū. By Eastern informants it was called *arrowhead-sharp-pointed* and *arrowhead-projecting* xaga'-datīp and xaga-dīset.


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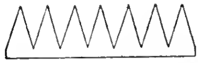
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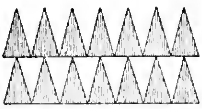
In almost all cases where triangles of any kind are arranged in rows so that the apexes of one row touch the bases of the row next above, they do so at the ends of the bases and not in the middle. Only a single case (fig. 45) has so far been found of the latter. No special name is given for this pattern, it being considered simply a repetition of that of figure 44.

In the main Pomo design elements are combined to form complex patterns, but upon rare occasions a single triangle or other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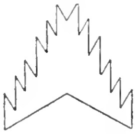
element is found placed alone. A few cases of a single sharp pointed triangle (fig. 46), or having even a sharper point, have been found. The name *design sharp* or *arrowhead sharp* is usually given for this single element, as well as for those seen in figs. 43-45, where these sharp pointed triangles are combined.

A single case of the odd arrangement of sharp pointed triangles shown in fig. 47 was found. By some informants this was simply called a new fashioned or white man's design. By one Eastern informant, however, it was called *arrowhead-projecting* xaga'-dīset.

In figs. 48-52 are found various combinations of these sharp pointed triangles with different kinds of large triangles. All these except that of fig. 49 are of very rare occurrence. The design of fig. 49, however, is found quite often. In general the names of

all these designs are the same and mentioned the large triangle as well as the small sharp pointed ones set upon its sides. Among the Northern Pomo such figures are called datō'ī kata xōltū kat-ca'k daien, *design empty on-both-sides arrowheads collected,* datō'ī dasīdasīka, *design scattered,* or xō'ltū kateak, *on-both-sides*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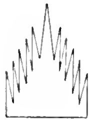
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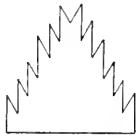
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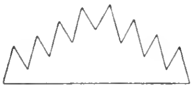
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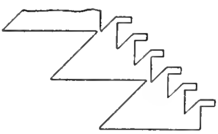
52

arrowheads. By the Central informants these figures are usually spoken of as katca'-dalaū katca-mset, *arrowhead-half arrowhead-sharp,* though they may be called katca'-dalu-mset, *arrowhead-half-sharp,* or the name may even be abbreviated still more to katca'-mset *arrowhead-sharp.* From Eastern informants several different names were obtained, as follows: xaga' hna dīset, *arrow-head and (or with) projecting,* xaga'-daset, *arrowhead-barbed,* xaga-mīset, *arrowhead-sharp,* and kama mīset, *mark sharp.*

The design shown in fig. 53 is a combination of the arrowhead with the quail plume and the names given it mention both these elements. It is called by Northern and Central informants *quail-plume arrowhead,* cakaga-kēya kateak and caka'ga-kēya katca respectively, and by Eastern informants *arrowhead and (or with) quail-plume,* xaga' na cag'ax-xe.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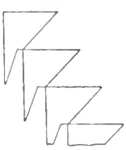
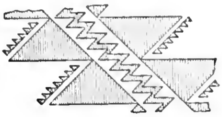
The design of fig. 54 has been found in but one case. It was called by a Northern informant *design-sharp,* datō'ī-ditīp, by Central informants *arrowhead-sharp,* katca'-mset, and by Eastern informants simply *arrowhead,* xaga'. This is a very unusual and apparently new pattern, though the diagonal line of large isosceles right triangles with many ordinary sharp pointed projections on the lower side


54

of the line is fairly common. Such a pattern is shown in pl. 18, fig. 2.

In fig. 56 is represented one of the typical center designs used in connection with such a complex pattern as that in fig. 55. This design is but rarely found by itself as the pattern of a basket, but frequently occurs in combination with such other elements as



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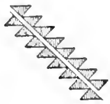
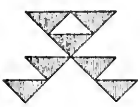


56

compose the pattern of fig. 55, in which case this design takes the place of the zigzag there shown. In this schematic figure the space between the two rows of isosceles triangles has been left blank, making of it merely a white line. In some patterns, however, this space is filled with various other design elements, as for instance a zigzag, or small rectangular figures as is the case in the pattern of the basket shown in pl. 17, fig. 6. Informants named this figure as follows: Northern Pomo, katca'k dilē dakīkītinka, *arrowhead in-the-middle scattered-along-in-a-line,* and datō'ī kata dilē katca'k yo-wil, *design empty in-the-middle arrowheads downward;* Central Pomo, katca'-dalaū tatū tcūwan, *arrowhead-half one (or single) stripe;* and Eastern Pomo, xalū'tūduk hna xagadaset, *striped-watersnake and (or with) arrowheads-barbed.*



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The interesting lines of isosceles triangles shown in figs. 57 and 58 are called by similar names, notwithstanding the fact that they are arranged in the first case with their points downward and in the second case with their points upward. By Northern informants they were called datō'ī maa mina-datē'kama, *design acorn crossing,* katcak mina-datēkama, *arrowhead crossing,* and datōī datī'pka kana daiyckamū, *design sharp-points close meet (singular).* Central informants called them katca'-mtil ūna'Liū, *arrowhead-slender crossing,* and katca'-dalaū ūna'Liū, *arrowhead-half crossing.* By Eastern informants they were both usually

called xaca'icai wīinalīhempke, *butterfly crossing,* or xaca'icai xōldabēhmak, *butterfly meet.* One informant, however, while giving the latter name for fig. 57 gave xaga'-daLaū xōldabēhmak, *arrowhead-half meet,* as the name for fig. 60. It does not appear that the direction in which the triangles point in either of these figures, any more than in other similar cases, such as figures 22-24, establishes whether the design shall be called butterfly or arrowhead-half among the Eastern Pomo.


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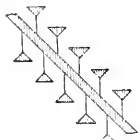
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In figs. 59 and 60 are shown designs which are practically the same, the only real difference being that in the one case the arrangement is horizontal and in the other case diagonal. Only a single example of either of these has as yet been found. They were both called by Northern informants datī'pka dilē masa'-kalak, *sharp-points in-the-middle striped-watersnake,* and by Central informants katea'-mtil īteai, *arrowhead-slender resemble.* Also by other Central informants the components of these patterns were separately named kawī'na-ūtea, *turtle-neck,* the triangular portion of the figure, and msa'kale, *striped-watersnake,* the line in the middle of the figure, in each case. Eastern informants called these figures xaca'icai dilē gaiya kalū'tūduk, *butterfly in-the-middle gaiya striped-watersnake.* This design in its diagonal arrangement is shown in pl. 17, fig. 2.


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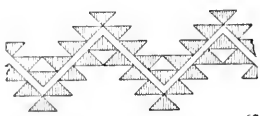
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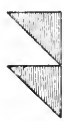
63

An unusual arrangement of triangular elements seen in fig. 61 has been found in one case as the central portion of a band of large triangles, such as those in fig. 25. This design was called by some informants simply *arrowhead,* and by others new or *white man's design.*

Also used as the central part of a band of large triangles, the design shown in fig. 62 has been found, though its use is not at all common. The names obtained for this were simply *arrowhead,* except among the Central Pomo, where *arrowhead-slender,* katca′-mtil, was mentioned by one informant.

An unusual arrangement of triangular figures, seen in fig. 63, was found upon one large boat-shaped basket. This was called in most cases simply arrowhead, though arrowhead-barbed, katca′-daset, and arrowhead-sharp-pointed, xaga′-datīp, were obtained among the Northern and Eastern Pome respectively, and arrowhead-half, katca′-dalaū and xaga-daLaū, among the Central and Eastern Pomo. One Eastern informant also called it *butterfly,* xaca′icai.

Rectangular Elements.

The Pomo have a variety of four-sided figures, particularly rectangles. Upon the majority of twined baskets and upon many coiled there is found about the border of the opening a band consisting of a repeated rectangular figure. This is the case not only upon baskets whose general design arrangement is banded or horizontal, but also upon baskets the design arrangement of which is any one of the several employed by the Pomo. These rectangular designs are usually arranged in a single row immediately about the border of a basket, and may vary greatly in size, proportions, and arrangement. Figs. 64-72 give practically all the various forms of these bands of single rectangular figures. The general name applied to all these is *finishing design*, rendered by the Northern and Central Pomo baiya′kaū and by the Eastern Pomo hī′baiyax. A second term, hamaka′m, is also found among the Northern Pomo. On account of the prevalence among the whites of the impression that designs of this kind, particularly when made up of small squares, have to do in some way with a fish net, informants were especially questioned upon this subject, and maintained that none of the three terms given have any connection with a fish net. On the other hand they insist that the names mean simply finishing design. In speaking of baiya′kaū informants maintained that the term is not only used to designate the design which finishes or completes a basket, but is a gen-

eral term used in speaking of any completed piece of work, as, for instance, the finishing of a house or a boat. Among the Central Pomo the design shown in fig. 71 received the name baiya'kaū kam*t*il*t*ilī-ūī-kūwī, *finishing design killdeer's-eyebrow*, on account of the presence of two comparatively small vertical figures or lines at the ends of the large rectangular figures. No such distinction however was made by informants of the other two dialects. Of these several designs the one seen in fig. 64 is by far


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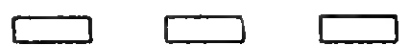
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the most common. The designs shown in figs. 65 and 66 are met with quite frequently, but those of much greater length (figs. 67, 68) are rarely found except as worked into the hoop binding of mortar and burden baskets. The design shown in fig. 69 has been found only once, and that in fig. 70 but once as a border finish design. Also only a single example of a border finish design such as that in fig. 72 has been found.

Certain of the above mentioned elements are found not only as finishing designs at the borders of the openings of baskets, but also in bands on the body of the basket itself. These are the designs shown in figures 64, 65, 66, 67, 70, and 72. By the Northern Pomo these designs are usually called dapō'kka, or *large-spots*. The name bicē'-o, *deer-teeth*, is also used. These elements are, however, different from the ordinary deer-tooth design (fig. 74). Central informants usually spoke of these designs as *deer-back*, pcē'-meō, though when very small that of fig. 64 was also

called *ants*, tūn′tūn. In addition to these two names certain informants spoke of them as *finishing designs*, giving the same name as if they had been placed upon the border of the basket, and stating that they were intended to be the same figures as those about the border. In the case of the design of figure 70, which occurred several times in the bodies of baskets, all the Central informants questioned gave it the name *finishing design*, baiya′-kaū. Eastern informants called these designs in most cases *potato-forehead*, bū′-dilē. These are not, however, the ordinary potato-forehead designs of the Eastern dialect, which are shown in figs. 80 and 95. By one Eastern informant the design of fig. 64 was called *deer-teeth*, bicē′-yaō.

In speaking of the finishing design it should also be noted that these same designs, as well as those of several other kinds, notably zigzags, such as that in fig. 139, are found quite commonly as the first or *inital design* upon the bottom of a basket, whether the design arrangement is horizontal, spiral, or diagonal. In such cases informants usually gave these designs, regardless of their form, a name which is best rendered by the term *initial design*. The various designs used initially are called caiyō′ī by the Pomo of all three divisions. The word appears to have certain other meanings, as follows: wedding or other presents made by one person to another. It does not apply, however, to the return present of equal value made, according to Pomo custom, by the second party to the first. The term is also applied to a prayer or wish for good luck, to the feast given to secure recovery from illness, and to beads thrown upon the dancing floor during a ceremony. The idea of a prayer or wish for god luck seems to be related to its use as the name of this initial design upon baskets; for some, at least, of the Indians believe that if the maker, especially of a twined basket, omits this design blindness will be the result, a belief very closely related to that connected with the dau or opening in horizontal or banded patterns.

A single example of a rectangular design such as that in fig. 73 has been found. Designs of such rather unusual kinds are ordinarily spoken of as *new*, new style, new fashioned, or white mans' designs. One Central informant, however, spoke of this figure as pcē′-meō tatū, *deer-back one (or single)*.

Square or other variously proportioned rectangles arranged in patterns of two or more rows are frequently found. One of the most commonly occurring designs is that shown in fig. 74, where a double row of very small squares or rectangles is placed horizontally in a band about a basket, or is used as the design for filling the space between the rows of large triangular figures in

73

74

spiral patterns. The former is the more common use. Its position in relation to the opening of a basket governs, to a certain extent, its name, as in the case of a single row of squares or rectangles. If used as a border about the opening of a basket, it is almost always called simply *finishing design*, baiya'kaū, or hamaka'm by the Northern, baiya'kaū by the Central, and hī'-baiyax by the Eastern Pomo. By some informants this was given the same name when used as a border about the opening of a basket or placed farther down in the body. In the latter position it is called by the Northern Pomo, bitū'mtū datōī, *ant design*, though it is also sometimes called, dapō'kka, *large-spots* or dapō'dapōka, *spotted*. Another name is *deer-teeth*, bicē-o, and one informant also called it *mosquito design*, bita'mta datōī. Central informants usually called it tū'ntūn, *ants*, if made up of very small rectangles, and *deer-back*, pcē-meō, if made up of larger rectangles. Eastern informants, however, gave more frequently *deer-teeth*, bicē'-yao, though tūntūn, *ants* was also used. When the rectangles are very small, ant design is almost always the name applied to this design by the people speaking each dialect. Deer-teeth implies a design composed of larger rectangular, usually square, figures. Spots or large spots is more usually applied to a design consisting of comparatively large rectangular figures particularly if they are placed at considerable distances from one another, though these names are not so used extensively in any case.

Small squares or rectangles arranged in patterns consisting of more than two rows as shown in figs. 75 and 76 are quite frequently met with. In the main all informants questioned named

these two figures the same. The Northern Pomo called them *ant design*, bitū'mtū datōī. By one Northern informant was added the qualifying term datsa'i-banem, signifying *broad-band*. Central informants called these designs *tū'ntūn* tcī or *tūn'tūn*.


75


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etot, *ant design or ant band*. Eastern informants called them bicē'-yao, *deer-teeth*, bicē'-yao kūt, *deer-teeth small*, and *tūntūn*, *ants*. In the case of the design shown in fig. 76, however, some informants noted the presence of the lines bordering the band of small rectangular figures. By one Central informant the name msa'kale, *striped-watersnake* was given, and by one Eastern informant, kalū'tūduk na xam bū-dile, *striped-watersnake and (or with) among potato-forehead*.

A few cases of a design consisting of rectangles such as those in fig. 77 have been found. This design was called by Northern Pomo informants datōī dapō'kka datsa'i-banem, *design large-spots broad-band*. By Central informants it was called *deer-back*, pcē'-meō, to which the word *band*, *etot*, was added by certain of them since this design occurs only in a horizontal or banded arrangement. Eastern informants gave this design the name bū'-dilē kō'nawa kalū'tūduk, *potato-forehead on-both-sides striped-watersnake*. Some called it simply *potato-forehead*, taking no account of the presence of the two lines on the sides. By one informant it was called *tū'ntūn* tīa, *ants big*. In this last name appears a practice which is met with quite frequently and which shows the prevalence of modifying terms in Pomo design names. Here the word big is added to the name of the design for the reason that the rectangles are in this case considerably larger than those in the regular designs called ants, such for instance, as is shown in fig. 75. In the same manner, a line of small rectangles (fig. 74) and which would ordinarily be spoken of by some informants as ants, might be called by others deer-back small or potato-forehead small, they


77

being smaller than the rectangles ordinarily referred to by the names deer-back and potato-forehead.

78

One instance of a rectangular design such as is shown in fig. 78 has been found. Northern Pomo informant called this design bicē'-maō dilē dakīkītin, *deer-back in-the-middle scattered along.* Central informants called it simply *deer-back* or *deer-back band,* pcē'-meō or pcē'-meō *etot.* A name for the design was obtained from but one Eastern informant who called it La'l-a-pa, *goose-excrement.* This, however, is not the design ordinarily referred to as goose excrement by Eastern informants. That design is composed of parallelograms whose angles are other than right angles, such, for instance, as those shown in figs. 103 and 105.

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Another rectangular design found upon only one basket is that shown in fig. 79. By Northern Pomo informants, this was called *deer-back broad-band,* bicē'maō datsai-banem or simply *deer-back,* bicē'-maō. Central informants called it *deer-back band,* pcē'-meō *etot,* or simply *deer-back,* pcē-meō. The name given it by Eastern informants was *potato-forehead* or *potato-forehead big,* bū'-dilē or bū-dilē tīa.

The design seen in fig. 80 occurs very frequently, in fact, almost as frequently as that of fig. 74. The lengths of these rectangles vary, and the particular rectangles here shown are only typical of the variously proportioned ones which are considerably longer than they are broad. They all bear the same names. This double row of long rectangles arranged horizontally is most frequently called by the Northern Pomo bicē'maō, *deer-back,* though it is also frequently spoken of as *large-spots* dapō'kka. The name *deer-back,* pcē'-meō, was uniformly obtained from Central Pomo informants, while bū'-dilē, *potato-forehead,* was the name usually obtained from Eastern informants. To this name xōtcagan, *running-along-in-pairs,* was also added by one inform-

ant, in the case of one of the many examples of this design. By another Eastern informant this design was called bicē'-tō kama, *deer-stand-in mark.*

Designs consisting of two or more rows of long rectangles,

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such as those shown in figs. 81 and 82, are occasionally met with. Northern Pomo informants called these *deer-back design*, bicē'-maō datōī, or *large-spots*, dapō'kka. Central and Eastern informants gave respectively the names *deer-back* and *potato-fore-head*, peē'-meō and bū'-dilē to both designs. In the case of the design shown in fig. 81, one Central informant added *ete'ltele*, which signifies *hitched-together or connected*, to the ordinary term deer-back.

83

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One case of the combined line and rectangle design or, more strictly speaking, pattern (fig. 83) was noted. Northern Pomo informants called this mīsa'kalak xōltū dapō'kka tcacītemūl, *striped-watersnake on-both-sides large spots going-around-and-meeting (plural).* Central informants called it peē'-meō tcī ta-kanma tciltaū, *deer-back design far-apart stuck-on.* Eastern informants gave the name bū'-dilē xam xalū'tūduk, *potato-forehead among striped-watersnake.*

In fig. 84 is represented a design based primarily upon rectangular figures, arranged in two bands about a large globose plain twined cooking basket. By one Eastern informant this design was called simply *ant mark*, tū'ntūn kama. By Northern Pomo informants, however, the more descriptive term, bitū'mtū dilē masa'kalak, *ants in-the-middle striped-watersnake* was given. By one Central informant *ant mark*, tūntūn kama, was given as the name of this design, but by others *finishing-design band*, bai-ya'kaū etol, or the more descriptive name, *finishing-design string in-the-middle stripe*, baiya'kaū slema lala tcūwan, was given.

A single case of a rectangular design such as that in fig. 85 was found. Northern Pomo informants called this dapō'kka dilē eīke'tka, *large spots in-the-middle stripe.* By one informant also it was called maaka'tōla datōi, said to signify *acorn-cup design.* Central informants called it peē'-meō tatū, *deer-back one (or single),* though baiya'kaū, *finishing-design,* was given in one case. From Eastern informants bū'-dilē, *potato-forehead,* and bū'dile xalī, *potato-forehead one (or single),* as well as bicē'-yaō, deer-teeth, were obtained as names.

85

In fig. 86 is seen an unusual rectangular design and one of rare occurrence. Its Northern Pomo name is bicē'-maō dilē daki'tka, *deer-back in-the-middle scattered-around.* Also bateō'tama dīka'tka, *one-on-top-of-another pushed-over* was given as its name by another informant. By most Central informants it was called *deer-back band,* peē'-meō *etot,* though by one it was called simply *white man's design,* masa'n teī, meaning that it was not an aboriginal pattern. Its Eastern name is *deer-back mark,* bicē'-maō kama.

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Fig. 87 shows a pattern found in only one instance. By Northern informants it was called daki'tka, *scattered-around* by Central informants peē'-meō *etot, deer-back band,* or peē'-meō base't *etot, deer-back ugly (or imperfect) band.* Its Eastern dialect name is bicē'-yaō, *deer-teeth.*

The rectangular design represented in fig. 88 is found occasionally as a separate pattern worked in a colored fiber material on the surface of the basket (pl. 21, fig. 3), or it may be worked in white material in the center of a larger figure made of colored fibers, as, for instance, a large triangular figure. In such a case, the portion of the design appearing in this schematic figure in black is, of course, white. The names given to this design are as

follows: by the Northern and Central Pomo, *deer-back*, bicē'maō and pcē'-meō respectively: by the Central Pomo, the modifying terms tcadōtcadō tcil, *circular stuck-on*, were added to pcē'-meō in one case, and the term ptcō'yai, *short (plural)*, was added upon another occasion. By the Eastern Pomo the design was called bū'-dilē or bū'-dilē winalīhempke, *potato-forehead* or *potato-forehead crossing*.


89


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What may be called the negative of the design shown in fig. 88 is found in fig. 89. In all three of the Pomo divisions it is called *deer-back*. From the Eastern Pomo the name *potato-forehead* was also obtained. This figure is of very rare occurrence.

Diamond shaped or square patterns (fig. 90) consisting of small rectangles are occasionally found. One Northern informant called this pattern dapō'dapō, *spotted*, referring to the whole mass of small rectangles as a unit. Central informants spoke of it simply as *deer-back*, pcē'meō, and Eastern informants called it *potato-forehead*, bū'-dilē.


91


92

Rectangular designs of slightly more frequent occurrence are those in figs. 91 and 92. Here, as in other cases where designs consisting of small squares or rectangles are concerned, the size of the component rectangles governs the name. To both these patterns Northern informants applied the names dapō'kka, *large-spots*, bicē'-maō, *deer-back*, and bitū'mtū, ants, according as the size of the rectangles varied from large to small. In the Central dialect pcē'-meō, *deer-back*, was the only elemental name obtained for either of these figures, though various qualifying terms, such as tcī'ltaū, *stuck on (plural)*, ptcō'yai, *short (plural)*, and katsu't-tciū, *swelled*, were used by different informants. By the Eastern Pomo, a distinction similar to that among the Northern is made.

A design of large rectangles is called bū'-dilē, *potato-forehead,* and one of small rectangles, *t*ū'n*t*ūn, *ants.*

Small rectangles, arranged in the form of a zigzag as shown in fig. 93, are occasionally found. The fact of the zigzag arrangement of these elements seems not to have impressed the informants in this case, though in the design seen in fig. 94, which is practically identical with that in fig. 93 except that double instead

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94

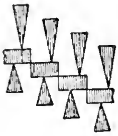
of single rows of rectangles are used, they made mention of the zigzag arrangement in almost all cases. In the case of the design shown in fig. 93, the simple name *deer-back*, among the Northern Pomo bicē'-maō, and among the Central Pomo peē'-meō, was given, while the name given by the Eastern Pomo was *ants, t*ū'n*t*ūn. In the case of the design shown in fig. 94 similar names, but with zigzag added, were given. By Northern informants it was called bi*t*ū'm*t*ū tsīyōtsīyōka, *ants zigzag.* By Central informants it was called peē'-meō tsīyōtsīyō, *deer-back zigzag.* Eastern informants differentiated the patterns according to the size of the rectangles comprising them, calling the comparatively large rectangles bū'-dilē dzīyō'dzīyō, *potato-forehead zigzag*, and the small ones *t*ū'n*t*ūn dzīyōdzīyō, *ants zigzag.*

One of the more commonly occurring designs composed of rectangles is that shown in fig. 95. This design often occurs alone

95

as a pattern covering the entire surface of a basket. The diagonal rows of rectangles are placed with more or less space between them. In such cases, the design is almost always called by the Northern and Central Pomo *deer-back*, bicē'-maō and peē-meō respectively. By the Eastern Pomo it is called *potato-forehead*, bū'-dilē. In case, however, the component rectangles are comparatively small, the name given to this design by informants of all three divisions was *ants,* bi*t*ū'm*t*ū in the Northern, and *t*ū'*t*tūn in both the Central and Eastern. In addition to its use alone as a pattern proper, it is

also frequently used as one of the constituent elements of a complex pattern. Instances of this are found in figs. 34 and 36 which, however, do not occur so frequently as patterns similar to that shown in fig. 55 in which a diagonal line of rectangles runs through the middle of the pattern in the place here occupied by the zigzag. Instances of such patterns occur on the baskets of pl. 18, figs. 5, 6, and pl. 19, fig. 3. The names given it under these circumstances in the different dialects are the same as those used when it is employed alone as a pattern. It is noticeable, however, that when employed thus, it is more frequently called deer-back or potato-forehead, probably due as much to the fact that the other figures composing the design are compara-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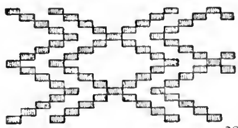

98

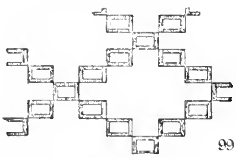
tively larger than these rectangles as that they themselves are actually very small. In one of the cases above mentioned, that shown in fig. 36, the pattern is named by the Northern Pomo datō'ī kata xōltū bieē'-maō bitcūtcai, *design empty on-both-sides deer-back small (plural)* or datō'ī kata xōltū bitūmtū datōī, *design empty on-both-sides ants design*. These differences in name are due, as before stated, to the differences in size of the rectangles, though the same figure may be named deer-back by one informant and ants by another, according to the informant's personal conceptions of these particular elements of the pattern and according as their relative sizes differ. Similar descriptive names in which the rectangular element of the design is mentioned are given by the Central and Eastern Pomo, who call it respectively katca'-dalaū pcē-meō malada tcūwan, *arrowhead-half deer-back near stripe*, and bū'dilē xaga kō'nawa gadil, *potato-forehead arrowhead on-both-sides passing-along (plural)*.

Another example of this design combined with a different element is shown in fig. 96, in which the rectangular part is the principal element instead of one of the subordinate elements as is most generally the case. Only one example of this pattern has as yet been found. It was called by Northern and Central Pomo

informants *deer-back*, but one Northern informant gave as its full name bicē'-maō tū ditī'pka, *deer-back side pointed.*

In figs. 97 and 98 are shown designs consisting of single and double rows respectively of rectangles so arranged that the rows cross each other. The names in both these cases are the same, no account being taken of the fact that one consists of single and the other of double rows of rectangles. They are called by the Northern Pomo bi*t*ū'm*t*ū datōī mina-da*t*e'kamū, *ant design crossing,* and bicē'-maō mina-da*t*ē'kamū, *deer-back crossing.* By the Central Pomo they are called pcē'-meō ūnaLiū, *deer-back crossing,* and by the Eastern Pomo bū'-dilē wīna'līhempke, *potato-forehead crossing*, and *t*ū'n*t*ūn wīnalīīhempke, *ants crossing.* In crossing, these lines of rectangles form hollow diamond shaped figures. The ordinary figure of this shape is called by the Northern Pomo *turtle-back*, kawī'na-tcīdik and by the Central Pomo *acorn-head,* pdū'-cna and it is an interesting fact that some informants make compound names out of deer-back or ants and turtle-back or acorn-head as, for instance, pcē-meō pdū'cna, deer-back acorn-cup, thus not only naming the lines of rectangles which constitute the elements of the pattern, but also mentioning the large figures which these lines form.

One case of a design composed of lines of hollow rectangles so arranged that they cross each other (fig. 99) was found. Two



99

Northern Pomo informants gave the name kawī'na-tcīdik, *turtle-back,* but this probably referred to the large hollow diamond shaped figure formed by the crossing lines rather than to the small hollow rectangles themselves. One Eastern informant gave to this design the name xaitsa'kai kama, which may be roughly rendered, *stretcher design.**

Rhomboidal Elements.

Quite common among Pomo designs are rhomboidal figures. These may be variously arranged in single rows or in patterns from two to four rows in width. The proportions of the length and breadth of these rhomboidal figures vary greatly,

* The term stretcher as used here is explained above in the discussion of the design in fig. 15.

as do also their angles. The various forms in which these rhomboids occur are shown in figs. 100 to 113. Since these designs stand mid-way between those composed of the rectangular figures just treated, and the zigzag designs such as 148, etc., and since they vary considerably in form and arrangement, there are considerable differences in the names given them. By Northern informants the rhomboidal design shown in fig. 100 was called *deer-back*, bicē'-maō, *sharp-points*, datī'pka, and *zigzag*, tsīyō'tsīyō. By Central informants it was called *crow-foot (or track)*, kaa'i-kama, *deer-back*, pcē'-meō, and *zigzag*, ka'tīyōtīō. By Eastern informants it was called bicē'-tō, *deer-stand in*. The connection is not very clear and no satisfactory explanation could be obtained from the Indians as to this last name. It was also called xatī'yo'tī'yō, *zigzag*, xaga'-dīset, *arrowheads-projecting*, and dītīp, *sharp*.

100

The design shown in fig. 101, which differs from that of fig. 100 only in having a heavy line bordering the lower side of the double row of rhomboidal figures, was called by Northern Pomo informants datī'pka datsa'ibanem, *sharp-points broad-band*, also by one informant, bicē'-maō, *deer-back*. It should be remembered, however, that the regular deer-back design is composed of rectangles and it is probable that this informant did not here, as in the case of the design shown in fig. 100, differentiate between the rectangles and the rhomboidal figures. Central and Eastern informants gave respectively the names kaa'i-kama, *crow-foot (or track)* and bicē-to ku'ta, *deer-stand-in-small*. But one instance was found of this particular design.

101

The design shown in fig. 102 was found upon two baskets. It differs from the last mentioned only in having a line on each side instead of on but one side of the double row of rhomboidal figures. The names bicē'-maō datsaibanem, *deer-back broad-band* and ka'tsīyōtsīyō, *zig-zag*, were given by Northern informants to this design. Central informants all called it kaa'i-kama, *crow-foot (or track)*. Great-

102

er differences are found, however, in the names given it by Eastern informants. It was called xatī'yotī'yō, *zigzag*, biceē'maō, *deer-back*, bū-dilē tsīyō'tsīyō, *potato-forehead zigzag*, and eō bax kama, *east this mark*, commonly spoken of as a "design from the east." One informant who frequently used this term maintained that the patterns to which she applied it were actually extraneous ones, introduced to the Eastern Pomo from the people living to the east of them. Other informants, however, claimed that these designs were original with the Pomo and that this name did not imply that they were introduced from any other people.

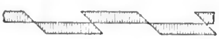
103

104

One example of a design consisting of a quadruple row of long rhomboidal figures such as that in fig. 103 has been found. One name obtained for this design among the Northern Pomo was bicē'-maō, datsa'ibanem, *deer-back broad-band*. It was called kaa'i-kama, *crow-foot (or track)*, and kaa'i-kama kōlai, *crow-foot (or track) long (plural)* by Central informants, and Lal-a-pa, *goose-excrement*, by Eastern informants.

Only one example has been found of a design consisting of a quadruple row of very small rhomboidal figures, such as that in fig. 104. This was called by the Northern Pomo kateak datsa'ibanem, *arrowhead broad-band*. By Central informants it was called kaa'i-kama, *crow-foot (or track)*, and pdū'-ena, *acorn-head (or cup)*. The one name obtained for it in the Eastern dialect was bicē'-maō, *deer-back*.

A design consisting of long rhomboidal figures but so arranged that they slant toward the left instead of toward the right (fig. 105) is occasionally found. This is called by the Northern Pomo sometimes dītī'pka datsaibanem, *pointed broad-band*, though they are also called bicē'-maō, *deer-back*, bicē'-yeē-nat, *deer-breast-?*, and dateē'kka, said to be the name of *a game* in which a long wooden or other skewer is thrust through as many as possible of a string of fish



105

vertebrae as the string is passing through the air. Central informants called it kaa'i-kama, *crow-foot (or track).* Eastern informants most often called it xatī''yō'tī'yō, *zigzag*, though here again the name cō'bax kama, *cast this mark*, appears.


106

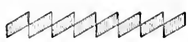

107

Examples of double or triple rows of these rhomboids (figs. 106 and 107) pointing toward the left and bordered by heavy lines have been found, although they are of very rare occurrence. They are called by the Northern Pomo *zigzag*, ka'tīyōtīyō, and *deer-back*, bicē'-maō. By the Eastern Pomo they are called either *zigzag*, xatī'yō'tī'yō, or *cast this mark*, oō' bax kama, and by the Central Pomo they are called *crow-foot (or track)*, kaa'i-kama.

The white rhomboidal design shown in fig. 108 was called by the Northern Pomo informants datsa'ibanem dilē datī'pka, *broad-band in-the-middle sharp-points.* By Central informants it was called kaa'i-kama, *crow-foot (or track)*, and by Eastern informants bū'-dilē xalī, *potato-forehead one (or single)*, and xaitsa'k na xal'ū'tūduk kadabemlī, *stretcher and (or with) striped-watersnake going-around (plural).* This design is of very rare occurrence.


108


109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One case each of a white rhomboidal design (fig. 109) and of a colored rhomboidal design (fig. 110) have been found. These are usually called simply zigzag by the people of the three Pomo divisions under consideration, though among the Northern Pomo the name datī'p dilē katca'k kale cīden, *sharp-point in-the-middle arrowhead white lead,* was obtained for the design shown in fig. 109. It is evident that the informant in this case took into account not only the white figures, which, to the minds of the other

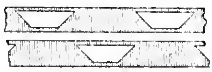
informants, constituted a zigzag, but also the dark sharp pointed portion of the pattern as well.

111

112

The unusual arrangements of rhomboidal figures such as appear in figs. 111 and 112 were found upon the same basket. The former was called by Northern informants bicē'-maō datsa'ibanem, *deer-back broad-band.* Both were called by Eastern informants La'l-a-pa hna xalū' cūdil kama, *goose-excrement (or with) blank lead mark,* and cō' bax kama, *east this mark.* Central informants claimed that both these patterns were new and had no regular Indian name, being simply called new fashioned or *white man's design,* masa'n tcī. The design of fig. 112 was called by Northern informants bicē'-maō datōī dilē kale cīde'n, *deer-back design in-the-middle white lead.*

113



114

The design consisting of a pair of parallelograms placed so that two of their oblique angled corners touch (fig. 113) has been found on a very few baskets. This was called by Northern Pomo informants datoi datipka, *design sharp-points,* and bicē'-maō datōi, *deer-back design.* By Central informants it was called kaa'i-kama, *crow-foot,* and ka'tīyotīyō, *zigzag,* and by Eastern informants usually dzīyōdzīyō or xatī'yotī'yo, *zigzag.* Another Eastern informant gave the name xama ditīp, *mark sharp.*

A single example was found of a design like that in fig. 114. This was claimed by some informants to be a new fashioned or *white man's design.* No Indian name was given by any of them for it.

Linear Elements.

The designs shown in the six figures 115 to 120 are what may be termed intermediate forms between angular figures of considerable length and true linear figures. Patterns of this kind

occur very rarely, one example only of each of these having thus far been noted. They are often called by informants new-fashioned or *white man's designs*, and, when given true Indian names, are usually called *striped* or *striped-watersnake.* In the case of the design shown in fig. 118, however, more descriptive

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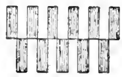

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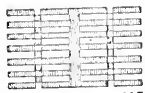

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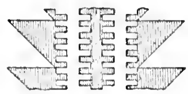

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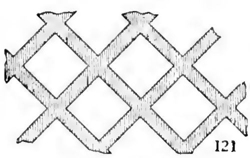
terms are employed by Northern and Eastern informants who respectively call this design mīsa'kalak xōl*t*ū katca'k, *striped-watersnake on-both-sides arrowheads*, and kalū'tūduk hna bicē-yaō, *striped-watersnake and (or with) deer-teeth.* The design shown in fig. 120 was called by Eastern informants xaga' dilē gaiya gadil xa'itsakai kama, *arrowheads in-the-middle gaiya passing-along (plural) stretcher mark.*

Simple lines arranged in such a manner that they cross each other (fig. 121) and form squares or diamond shaped figures are



121

occasionally found, but it happens more frequently that these crossing lines are met with in an elaborate crossing pattern where they are in combination with other design elements. When found thus alone, they are sometimes called simply *crossing.* An example of one of these simple crossing line patterns was called by the Northern Pomo wina-da*t*ē'kama, crossing or literally *top-lie-on*, by the Central Pomo ūna'Liū, *crossing*, and by the Eastern Pomo wīna-līhe'mpke, which has the same signification. In another case (fig. 233) which consists of crossing rows of a pattern formed from the triangular elements shown in figs. 17, 18, 19, and 20, the central space between the lines of triangles is left blank, thus making a set of crossing white lines. This pattern was

called by Northern informants *arrowheads crossing,* katca'k minadatēkama, and *arrowhead in-the-middle scattered-along-in-a-line,* katca'k dile dakīkīti'nka. By Central informants it was called katca'-mtil ūnaLiū, *arrowhead-slender crossing.* By Eastern informants the name given was xalū'tūduk hna xaga'-daset wīnalīhempke, *striped-watersnake and (or with) arrowheads-barbed crossing.*


122


123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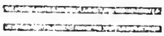
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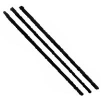
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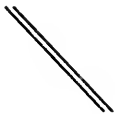
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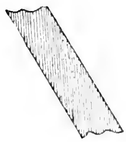

131

Straight lines of varying widths are frequently found on Pomo baskets. These may be arranged horizontally, diagonally, or vertically and may be placed so that two or three parallel lines form a broad pattern unit, as well as so that each line stands by itself. Examples of various arrangements of single or parallel lines of varying widths are shown in figs. 122 to 131. When used by themselves as patterns, these single or parallel linear figures are usually called *striped-watersnake* by all informants. Among the Northern Pomo the most common form of this name is mīsa'kalak, though mīsa'kala and masakalak are frequently found. Among the Central Pomo the name is the same with phonetic variations, msa'kale. Among the Eastern Pomo, however, this snake has an entirely different name, kalū'tūduk and

kalū'tūruk, of which the former is the more common. In addition to their independent use as the entire pattern of the basket, these linear figures are found very frequently in combination with other design elements, particularly in the complex diagonally arranged triangular patterns, which are so prominent on some forms of Pomo baskets. They may appear as lines of color through the center of one of these complex patterns, as is the case in pl. 22, fig. 5, or as white lines in this same position (pl. 28, fig. 1). In either case, particularly in the former, they are called striped-watersnake. In the latter case, however, they are not infrequently called by the Central Pomo *string*, sle'ma or sle'mat. Obviously, only the diagonal lines can be employed in the complex triangle patterns above mentioned and in these cases more than three parallel lines have not as yet been found, grouped together. A single line in the middle of one of these complex patterns is quite common. So far, no complex pattern horizontally arranged has been found containing either colored or white straight lines in its middle. It appears to make no difference whether there be one, two, or three lines arranged together, the names given are the same. The most commonly occurring of these designs are the single narrow horizontal line (fig. 122) and the single narrow diagonal line (fig. 127), the former being met with very frequently as a pattern in full, the latter almost as frequently as one of the elements of a complex pattern. The broader single lines in both these arrangements (figs. 124 and 131) are found only occasionally. A pattern consisting of a double narrow horizontal line (fig. 125) is found quite often. The remainder of the various linear designs above referred to, figs. 123, 126, 128, 129, and 130 are of comparatively rare occurrence.

In the cases of very broad linear designs such as those shown in figs. 126 and 131, other names than striped-watersnake are sometimes given. In the case of fig. 126, some Northern informants gave the name data'pka, signifying *a large area*, while one Central informant called it katca'k-kalatkaū, *arrowhead-drawn-out*, and an Eastern informant gave xaga'datap, *arrowhead-large-area*. The reason for the conception of this figure as a long pointed arrowhead is most likely to be found in the fact that

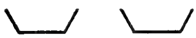
the design is worked vertically upon a curved surface, which naturally tends to cause it to narrow and approach more or less nearly a point at either end. Other informants, however, considered it simply a broad line. In the case of the design of fig. 131 the name given by one Northern informant was data'pka, *large area*.

132

133

The V-shaped design (fig. 132) has been found upon but a few baskets and in these cases was not at all prominent. It was always spoken of by Central informants as *sunfish-rib,* tsawa'l-msak, but it differs materially from the true sunfish-rib design as shown in figs. 224 and 225. Designs such as those shown in figs. 132 and 133 are considered as more or less new and are unnamed by some informants. The design shown in fig. 132 was also called by Northern Pomo informants tsīkē'ga, *zigzag* (?), and datō'ī cīket, *design striped.* By Central informants it was also called ditcī kalat. Ditcī signifies *design or pattern* and kala't is said to be applied to *approximately parallel lines,* such, for instance, as those which might be made by the dragging of two or three objects through the dust, which would result in lines not entirely straight and parallel but approximately so. Eastern informants also called this figure *sunfish-rib,* tsawa'l-mīsak, and *striped-watersnake,* kalū'tūduk. The one case where the design shown in fig. 133 occurred was on a rather coarsely woven basket of three-rod foundation. In such a basket it is obviously impossible to make a diagonal straight line, the nearest approach to this being a succession of small rectangles, each overlapping those nearest and projecting a little farther to the side than the one below. These small rectangular figures are called deer-back by the Northern and Central Pomo, and potato-forehead by the Eastern Pomo. The names given by some informants to these designs were simply *deer-back,* bicē'-maō among the Northern Pomo and pcē'meō among the Central Pomo, and *potato-forehead,* bū-dilē, among the Eastern Pomo. In addition to these

names, however, some of the Eastern informants also gave sunfish-rib, tsawa'l-mīsak, thus taking into account the angular nature of the design. As before stated, however, most informants called the designs of both these figures new or *white man's designs.*



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The same statement applies to the peculiar linear designs shown in figs. 134 and 135. These designs have been so far found upon a single basket each and were not given Indian names by most informants. The design shown in fig. 134 occurred, in the one case where it was found, as the initial design on the bottom of the basket shown in pl. 19, fig. 1, and informants gave it the name caiyō'i, *initial design.* One Eastern informant also called it bicē'-yaō, *deer-teeth,* while another gave its name as caga'x-xe, *quail-plume.* One Central informant called it simply ka'taiītcai, which is said to mean *separated (plural)* (?). As is shown in the illustration, but four of these figures occur in the circle of design, thus making the spaces between them very considerable. This undoubtedly accounts for this general name, which applies not only to this case where the constituents of the pattern are separated by considerable distances but also to all other designs where the distances between component parts are large.

In fig. 136 is shown a *cross* which was universally said by the Indians to be copied from the whites. It is a reproduction upon the basket of the cross of the Roman Catholic church, which has its churches in several parts of the Pomo country as well as a Franciscan Mission upon the southern shore of Clear lake. By Central informants, most of whom embrace the Catholic faith, this design was called karū's, clearly derived from the Spanish cruz. One Eastern informant called it kama' bana, *mark forked.* This, like most new designs, is found but rarely, and when used it is almost always secondary to the main pattern as is the case upon the basket shown in pl. 18, fig. 6.

136

An odd design is represented in fig. 137. It was called by Northern informants dasī'dasī-mūl, *scattered-around-in-a-circle,* also datō'ī bīyōbīyōka, *design little-pieces,* and dapō'dapōka, *spotted.* By Central informants it was called tsawa'l-msak, *sunfish-rib,* though tsīyō'tsīyō, *zigzag,* was also given. One Eastern informant called it tsīyō'tsīyō-dīset, *zigzag-projecting,* though

137

138

most Eastern informants simply called it eaiyōī, initial design, since in the one case in which it was found it occurred as a circle near the center of the bottom of the basket shown in pl. 16, fig. 6.

One case of the linear design in fig. 138 was also found. By informants of all three Pomo divisions this was called new or *white man's design,* but one Northern informant called it dīka'tka datōī, *pushed-over design.*

Zigzag Elements.

Among the most frequently occurring Pomo designs are various forms of zigzags. The various forms and arrangements of these zigzags are shown in figs. 139 to 194. Many of these, regardless of whether they are arranged horizontally, vertically, or diagonally and regardless of the thickness of their component lines or of the angles which these lines make with one another, are called simply *zigzag* by the informants of all the three Pomo divisions here considered. The term zigzag, by which the Indians seem to mean almost any crooked line or object, is most commonly rendered by the Northern and Central Pomo tsīyō'tsīyō and by the Eastern Pomo dzīyō'dzīyō. Different individuals, however, vary from these forms so that dzīyōdzīyō is occasionally used by Northern informants, and tsīyō'tsīyō is used by informants of all three divisions. In addition to these variants of the same term, which informants all claimed signify precisely the same thing, there is a term which is virtually the same as the above but preceded by ka or xa. Additional forms of these terms are therefore ka'tsīyōtsīyō, ka*t*īyō*t*īyō, ka*tī*'yō'*tī*'yō, xa*t*īyō-*t*īyō, and xa*tī*'yō'*tī*'yō. Ka or xa is never added before dzīyō'dzīyō.

Informants seem not to be very clear in their own minds as to the exact difference, if there is any, between tsīyō'tsīyō and its variants, and ka'tīyōtīyō and its variants. Some claim that the former is a general term applied to almost any kind of zigzag and that the latter is applied exclusively to the diagonal zigzag consisting of a horizontal straight line with a neck, or vertical straight line, much smaller and at right angles to the first, such as that in fig. 170. Others maintain that it is the name of a diagonal zigzag (fig. 176) in which both the horizontal portion and the neck are the same width, but the neck is much shorter than the horizontal portion. Some further restrict the term to figures of this description, but those in which the horizontal line and the neck meet each other at acute angles. However, none of these definitions are adhered to at all strictly in the naming of designs; some informants even using the latter set of terms as names for various designs which are not arranged diagonally at all. Close questioning has thus far failed to discover an exact and uniform meaning for these names, and it has therefore been deemed advisable to render both sets of term as *zigzag*. It has been suggested that ka'tīyōtīyō had reference to rippling water, the idea no doubt arising from the fact that water is called in the various Pomo dialects ka or xa, thus easily making *water zigzag*. The Indians, however, maintain that ka'tīyōtīyō has no connection whatever with water and that there is no place, as for instance a riffle, in a stream or any point in a lake which bears this name. In addition to the above mentioned names for zigzag designs they are also called by some Northern and Central Pomo informants tsīyō'tsīyōka and by the Eastern Pomo dzīyō'dzīyōka. Still another term rendered by Northern informants as zigzag is tsakō'-tsakōka, and a term of almost the same significance is dikō'tka, which the same people translate as wavy. The term tsīkē'ya probably also signifies zigzag, though no entirely certain and satisfactory translation has been obtained for it.

A zigzag design of very common occurrence is that shown in fig. 139. It consists simply of a narrow broken line, the successive parts of which meet each other in right or nearly right angles. The names given this design are tsīyō'tsīyō by the Northern and Central Pomo and dzīyōdzīyō by the Eastern Pomo.

A few cases have been found of what might be termed the negative of the design shown in fig. 139. This design, shown in fig. 140, consists of a broad band or as it might otherwise be conceived, a double row of large triangular features with a white zigzag line passing through its middle. The name here is the same as for an ordinary zigzag of colored material. In fig. 141 a

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variant of this design is shown. This design is in all respects the same as that in fig. 140, except that occupying the center of the white zigzag space is a line in color. This becomes more of a complex pattern and is, according to the universal Pomo custom, given names indicative of this complexity. By the Northern Pomo it is called datō'ī kata dilē tsīyōtsīyōka, *design empty in-the-middle zigzag.* By the Central Pomo shorter descriptive names are given: tsīyō'tsīyō tcī lala, *zigzag design in-the-middle,* or tsīyō'tsīyō le'Lan, *zigzag in-the-center.* Eastern informants gave this pattern the names kaca'icai kalūītūduk dzīyōdzīyō, *butterfly striped-watersnake zigzag.* and xaga' dilē gaiya kalū'tūruk dzīyōdzīyō, *arrowhead in-the-middle gaiya striped-watersnake zigzag.*

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Another form of horizontal zigzag, virtually the same as that in fig. 139 except that it is comparatively very broad, is shown in fig. 142. Its names are the same as for the zigzag of fig. 139.

The zigzag represented in fig. 143 differs from the last only in that its angles are very acute. It is, however, specially named by most informants. The Northern Pomo call it tsīyō'tsīyōka katca'k *zigzag arrowheads*, mina-datē'kama katcak, *crossing arrowhead*, and datī'pka, *sharp-points.* Central informants called it tsīyō'tsīyō katca-mset, *zigzag arrowheads-sharp,* and katca'-mset,

arrowheads-sharp. Eastern informants called it xaga′ dzīyō-dzīyō, *arrowhead zigzag*, and xaga′-dīset, *arrowhead-projecting*. As before stated, the general term zigzag is applied to this as well as to other similar designs.

Figs. 144 to 147 show zigzags consisting of narrow lines, every alternating one of which is vertical instead of both lines of each pair having the same slant as in the designs just described. Of

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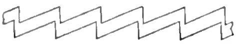
these designs the one shown in fig. 144 was called by informants simply *zigzag*. Those in figs. 145 and 146 were called not only zigzag but by Northern and Central informants *grasshopper-elbow*, cakō′-bīya, and cakō′-pīya, respectively. In the case of the design shown in fig. 146 some Northern informants gave the name katca′ dilē dzīyōdzīyō cīden, *arrowheads in-the-middle zigzag lead*, while certain Eastern informants also gave the names xaga′ dilē gaiya dzīyō′dzīyō gadīl, *arrowhead in-the-middle gaiya zigzag passing-along*, and dzīyōdzīyō xō′nawa xaga, *zigzag on-both-sides arrowheads*. This design has been found in but a few instances.

One case has been found of the design shown in fig. 147, to which the name *zigzag* is applied by the people of all these Pomo divisions. Also among the Northern Pomo the name datōī datī′p-ka dilē dzīyōdzīyō cīden, *design sharp-points in-the-middle zigzag lead* was found.

There are a number of rarely occurring zigzag designs consisting of comparatively wide lines varying greatly in length. Some are so short as to give the distinct impression of small rectangular or rhomboidal figures hitched together by their corners, while others are so long as to give the impression of true linear figures. Various arrangements of designs of this kind are shown

in figs. 148 to 154. Some, as that in fig. 154, have comparatively long narrow necks or connecting lines, while others, such as those in figs. 149 and 151 have none at all. To all of these, the general term *zigzag* is applied by informants of all of the three dialectic divisions under consideration. In the case of the design shown in fig. 153 the name bicē′-maō, *deer-back,* was also given by one Northern informant, though he at the same time stated that it



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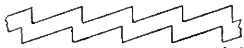

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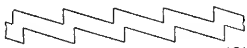

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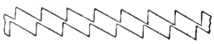

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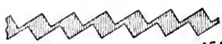

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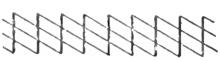
was a new kind of *deer-back* design and not the regular aboriginal pattern of that name. Another name given was kase′tka, *sharp-points.* One Central informant gave the name pdū′-cna, *acorn-head (or cup)*, to this design. The design represented in fig. 154 was called by two Northern informants cakō′-bīya, *grasshopper-elbow;* by a Central informant kapō′kpōkō kakaiûtcōm, *spotted kakaiûtcōm*, and by one Eastern informant bū′-dilē, *potato-fore-head.* All these designs are comparatively rare, some having so far been found but once.

Fig. 155 shows a design found upon only one basket. Northern Pomo informants spoke of this as dzī-yō′dzīyō dilē cīket, *zigzag in-the-middle stripe.* Central informants called it tsīyō′-tsīyō sībo katcōm, *zigzag three together;* and some Eastern informants gave the names kalū′tūduk na tsawal-mīsak, *striped-watersnake and (or with) sunfish-rib*, and bū′-dilē dzīyōdzīyō, *potato-forehead zigzag.*



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In the first of these Eastern names, the term striped-watersnake refers to the heavy vertical lines, and sunfish-rib to the lighter slanting ones.


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157

There are certain patterns which may be termed compound zigzags, that is, large zigzags which are composed of small zigzag lines. Designs of this sort are shown in figs. 156 to 162, to all of which the Indians gave the name *zigzag*, though to some of them other names were given as well. All these designs, except those in fig. 162, occur only as elements in complex pattern consisting of a horizontal band of large triangles, such as is shown in fig. 25, having the central space filled with one of these zigzag elements. Such complex patterns, containing the design elements shown in figs. 156 and 157, are called by the Northern Pomo datō'ī kata dilē tsīyō'tsīyō eīden, *design empty in-the-middle zigzag lead*, and by the Eastern Pomo xaga' dilē gaiya dzīyō'dzīyō gadil, *arrow-head in-the-middle gaiya zigzag passing along (plural).* No translation was obtained from Central informants for such a pattern as a whole, the component elements only being named. Neither one of these designs occurs very frequently.

About as frequently the pattern shown in fig. 158 is found.


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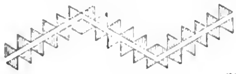
Owing to the fact that the zigzag portion is white it is necessary to show the entire pattern in order to give the zigzag itself. The entire pattern here given is called by the Northern Pomo datō'ī kata dilē tsīyō'tsīyōka, *design empty in-the-middle zigzag.* One informant also gave the name cakō'-bīya, *grasshopper-elbow*, on account of the sharp angles of the figure. Central informants called this pattern either simply *zigzag*, tsīyō'tsīyo, or *blank zigzag band*, kalū' tsīyōtsīyō *etot.* Eastern informants called it *arrowheads in-the-middle gaiya zigzag*, xaga' dilē gaiya dzīyō'dzīyō. One informant also called it *zigzag-projecting*, dzīyō'dzīyō-dīset.

The design shown in fig. 159, while being an element in the center of a broad band of design (pl. 16, fig. 4) is itself somewhat complex. Among the Central Pomo its name is kapō'kpōkō ctot lala sle'ma tcūwan, *spotted band in-the-middle string stripe*, and among the Eastern Pomo bicē'to xam tū'ntūn gadil, *deer stand-in among ants passing along (plural)*. The reason for the name ants appearing in this last case is that the white line in the middle of the pattern, as is thown in the illustration above referred to, appears more or less broken by colored fibers. No name was obtained among the Northern Pomo for this particular portion of the pattern, but it as a whole was called datō'ī kata dilē katca'k daien, *design empty in-the-middle arrowhead collected*.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In figs. 160 and 161 a simple zigzag arrangement of rhomboidal figures, in one case white and in the other colored, is shown. Both these are called *spotted*, dapō'kpōkō, among the Northern and Central Pomo. In addition, the design shown in fig. 161 is called by the Northern Pomo datō'ī kata dilē dasē-sē-tenka *design empty in-the-middle scattered along in a line*, and datō'ī dasetka, *design crossing*. By the Central Pomo it is called dapō'kpōkō lēLan katca, *spots in-the-center arrowhead*. By the Eastern Pomo it is called kaca'icai bū-dilē dzīyōdzīyō, *butterfly potato-forehead zigzag*, xaga' dilē gaiya xama paser gadil, *arrowhead in-the-middle gaiya mark tied-together passing along (plural)*, and dzīyō'dzīyō xaga xo''nawa dai, *zigzag arrowhead on-both-sides along*. Both these figures occur quite frequently.

Two examples of the compound zigzag design shown in fig. 162 have been found. This is called *zigzag* among all three Pomo divisions, but in addition it is called by the Northern Pomo dzīyō'dzīyō ūyūl dana daie'nga, *zigzag upward placed-close-together-in-a-row*. By the Central Pomo it is also called tsīyō'tsīyō

ūnaLiū, *zigzag crossing*, and by the Eastern Pomo kalel tsawa'l-mīsak, *nothing sunfish-rib*.

One instance of the design represented in fig. 163 has been found. This was called by informants of all three divisions new or *white man's design*. It was also called *zigzag* by certain informants. One Eastern informant also spoke of it as *deer-back*, bicē'maō.


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164

Another new or *white man's design* is shown in fig. 164. One Eastern informant, however, called this kaitsa'kai kama, *stretcher mark*, also the same informant said that it resembled the *deer-back* design, but was unlike either one.

A few cases of zigzag figures arranged vertically have been found. The names of such zigzags are in the main the same as those for zigzags arranged horizontally or diagonally. Certain informants, however, gave names other than zigzag and some used qualifying terms in connection with the terms signifying zigzag. The vertical narrow line zigzag (fig. 165) was called by


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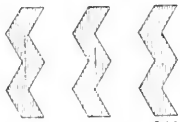
Northern informants cīke't datōī, *stripe design*, and ha'ske datōī, *tatto* design, the reference being to the zigzag figures which are occasionally found upon the faces of Pomo women. Tattooing, however, is comparatively rare among the Pomo, and when used usually consists of from one to four straight vertical lines upon the chin and perhaps one or two small horizontal lines at the corners of the mouth. Zigzags are very rarely used by them in tattooing, although with the Yuki immediately to the North, among whom tattooing is more prevalent, they are quite common. Among Central informants this design was called *striped-watersnake*, msa'kale, as well as *zigzag*, and among Eastern informants it was called kalū'tūduk kaiyūlal dabel, *striped-watersnake upward stir (?)*.

Two cases of a design practically identical with the last, ex-

cept that the line which forms the zigzag is very wide, have been found. This design is shown in fig. 166 and also in pl. 18, fig. 5.



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It is called by informants of all three divisions *zigzag*. Different informants of each division, however, use different forms of the term zigzag, some adding ka to the ordinary names for zigzag, as was mentioned when first speaking of zigzag designs. Thus by the Northern and Central Pomo respectively it is called tsīyō'tsōyō and ka'*tī*yo*tī*yō, and by the Eastern Pomo dzīyō'dzīyō and xa'*tī*'yō*tī*'yō. In addition to these names, it is sometimes given more descriptive ones, as, among the Northern Pomo ū'yūl dana tsīyōtsīyō, *upward rub (?) zigzag;* among the Central Pomo tsīyō'tsīyō ūyūl kaa tcūwan, *zigzag upward daylight (?) stripe;* and among the Eastern Pomo kalū'tūduk *tī*'yō*tī*'yō, *striped-watersnake zigzag.*

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168

The pattern shown in fig. 167 and consisting of a band of short broad zigzags was found upon one basket. In general, the name given it is simply *zigzag* or *zigzag band,* though Northern Pomo informants also gave the more descriptive term tsīyōtsīyōka datsaibanem dilē dapī'dapīka, *zigzag broad-band in-the-middle small-figures.* The idea of small-figures is not exactly clear in the schematic figure here shown, in which the narrow white lines appear as continuous. As a matter of fact, this design occurs on a basket of plain-twined weave and the narrow white line is but one stitch, or more properly but one warp stick in width, thus making it more or less broken and giving the effect, not of a true narrow white line but of a zigzag row of fine white dots. By Central informants it was called tsīyō'tsīyō ūyūl kana, *zigzag upward close.* One Central informant also called it tsawa'l-msak, *sunfish-rib.*

Another one of these vertical zigzags is seen in fig. 168. This design was called by Northern informants katca'k dase'tka datōī,

arrowhead crossing design, and by Central informants kaa'i-kama ka*t*eltaimaū *ctot, crow-foot (or track) interlocking band,* and also simply kaa'i-kama *ctot, crow-foot (or track)* band.


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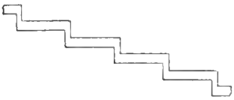
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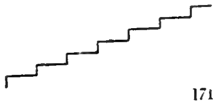
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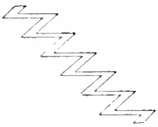
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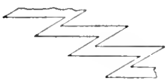
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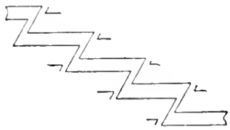
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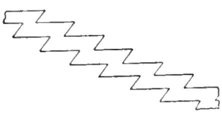
Of diagonal zigzags, there are a comparatively large number, some slanting very sharply toward the base line, others very gradually, some with their component lines making right angles with each other, others with their component lines making various acute angles with each other, some with longer or shorter connecting lines or necks of various widths, and some with no connecting necks at all. These various diagonal zigzags are shown in figs. 169 to 194. As before stated, there are two separate terms applied to zigzags in each of the three Pomo divisions under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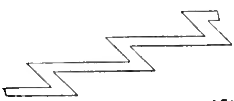
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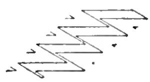
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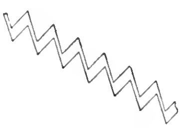
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consideration, one being a compound of the other with the addition of ka or xa before it and certain phonetic changes within it. The difference, if there be any, between these terms does not seem clear to the Indians, so that within the same dialectic group, one may be used by one informant and the other by another in speaking of the same design. This is particularly noticeable in connection with the diagonal zigzags as shown in figs. 169 to 180,

which have connecting lines or necks. In practically all cases each of these designs is called by both names by different informants speaking the same dialect. By the Northern and Central Pomo they are called tsīyō'tsīyo, ka'tīyōtīyō and katī'yō'tī'yō, while by the Eastern Pomo the names dzīyō'dzīyo, xatīyō'tīyō, katīyō'tiyō and katī'yo'tī'yō are used. The last four of these terms are practically the same but the variations are very distinctly noticeable. By some Northern and Central informants they are also called tsīyō'tsīyōka and by some Eastern informants they are called dzīyō'dzīyōka.

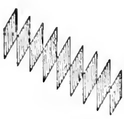
It is not feasible to illustrate with exactness each distinct form of zigzag found, since practically no two are exactly alike in their proportions, etc. Those here given are therefore types of their respective classes and in such designs as are shown in figs. 169 and 170 considerable differences in the length of the horizontal lines and of the connecting lines or necks are found. As these approach more nearly the form of rectangles with their corners joined, such as those in fig. 95, they are sometimes differently named by certain informants. For instance, some Northern and Central informants named certain patterns, of which figs. 169 and 170 are the typical forms, *deer-back,* bicē'-maō and pcē'meō, respectively, while Eastern informants named these same figures *potato-forehead* and *ants mark,* bū'-dilē and tū'ntun kama, respectively. The same is true of the design shown in fig. 172. Similarly, one Central informant called the sharp angled zigzag in fig. 179 *deer-elbow,* pcē'-pīya and one Eastern informant called the design shown in fig. 178 *grasshopper-elbow,* cakō'-bīya. The very sharp angled zigzag represented in fig. 180 was also called by Northern informants katca ū'yūl dana daienga, *arrowhead upward rub (?) placed-close-together-in-a-row,* by Central informants katca'-mset dītcī, *arrowhead-sharp design,* and by Eastern informants xaga'-daset dzīyōdzīyō, *arrowhead-barbed zigzag.*

The diagonal zigzag designs just mentioned are found in use by themselves as entire patterns, but they are found perhaps more frequently in combination with other design elements to make complex patterns. The most commonly occurring of these diagonal zigzag designs are the ones shown in figs. 174, 169, 172 and 180, named in the order of their frequency.

In figs. 181 to 186 are shown a series of rhomboidal figures of different proportions arranged in diagonal lines, forming zigzags. In all these, each one of the small rhomboidal figures is so placed that two of its diagonally opposed corners touch similar corners of the adjacent rhomboidal figures. To each of these designs the general name *zigzag* is given but, in addition, certain other names are given to some of them. The design shown in fig. 181 has been called by Northern informants bicē′-maō, *deer-back*, and in one case it was called katca′k, *arrowhead*. By Central informants the name katca′-mtil, *arrowhead-slender* was given, while by some Eastern informants the names bicē′-maō, *deer-back*, bicē-yaō, *deer-teeth*, bicē′ tō, *deer stand-in*, and cō-bax kama, *east this mark*, were given. This design is very frequently found combined with large triangular design elements to form a complex pattern, similar to that shown in fig. 55. Such a pattern is shown also in pl. 17, fig. 5.

181

Similarly in the case of the design shown in fig. 182 Northern informants sometimes called it datō′ī maa, *design acorn*, bicē′-maō, *deer-back*, and katcak, *arrowhead*. Central informants sometimes called it kapō′kpōkō, *spotted* and Eastern informants gave the name bicē′-tō kama, *deer stand in mark*. This design occurs quite frequently as an element compounded with large triangular figures to form a complex pattern. It is much less frequently met with, however, than the design shown in fig. 181.



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A few instances of the design shown in fig. 183 have been found. In all cases it is the middle design elements of a pattern of large triangles, such as is shown in fig. 55. Names other than zigzag were obtained for this, as follows: among the Northern Pomo datōī datī′pka, and dase′tka, *design sharp-points* and *crossed* respectively; among the Central Pomo katca′-mtil, *arrowhead-slender*, and cō-ma ke′kama, *east-place from mark;* and among the Eastern Pomo datīp, *sharp pointed*, also dzīyō′dzīyō-dīse′t *zigzag-projecting*.

183

A very few examples of the design shown in fig. 184 have been found. The only names other than *zigzag* obtained for this design were found among the Central Pomo. One informant called it katca', *arrowhead*, and another kaa'i-kama, *crow-foot (or track)*.


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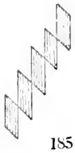
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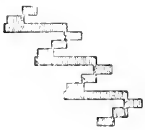
186

The designs shown in figs. 185 and 186 have thus far been found in but one case each. The one name, other than *zigzag*, obtained for either of these was found among the Central Pomo, where one informant gave pcē'meō, *deer-back*, as another name for the design of 186.

The peculiar zigzag seen in fig. 187 was given names as follows: by the Northern Pomo dzīyō'dzīyo or tsīyō'tsīyō, *zigzag*, bū'-dilē, *potato-forehead*, which it derives from the slanting rows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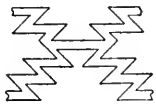
189

of small rectangles, and tsakō'tsakōka, *zigzag*. By the Central Pomo it is called tsīyō'tsīyō, *zigzag;* and by the Eastern Pomo bū'-dilē dzīyō'dzīyō, *potato-forehead zigzag*. This unusual pattern was found upon but one basket.

Another peculiar pattern found upon a single basket is that shown in fig. 188. This was called by informants of all three of the Pomo divisions zigzag, but by Northern and Eastern informants it was also called bicē'-maō, *deer-back*, and by Central informants kaa'i-kama, *crow-foot (or track)*.

Occasionally a crossing zigzag is found. Such a design is shown in fig. 189. Designs of this kind were called by Northern informants tsīyō'tsīyōka kana daye'tkamū, *zigzag close meet (plural);* by Central informants ka'tīyōtīyō ūnaLiū, *zigzag crossing;* and by Eastern informants dzīyō'dzīyō wīnalīhempke, *zigzag crossing*.

The Z shaped designs represented in figs. 190 and 191 were found upon only a few baskets. The former, in fact, was found but once. It was called by Northern Pomo informants bicē'-maō datsa'ibanem *deer-back broad-band;* by Central informants kaa'i-kama, *crow-foot (or track);* and by Eastern informants Lal-a-pa,

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191

goose-excrement. The design in fig. 191 was variously named by different informants. By the Northern Pomo it was called ka'tīyōtīyō, *zigzag*, bicē'-maō datōī, *deer-back design*, datī'pka datsaibanem, *sharp-points broad-band*, and ditce'kka, said to be the name given to a game in which a wooden or other skewer is thrust through a string of fish vertebrae as it passes through the air. Central informants gave this design the names ka'tīyōtīyō etot, *zigzag band*, and kaa'i-kama, *crow-foot (or track)*. In one case also in which this design appears near the edge of a flat plate-form basket it was called baiya'kaū, *finishing design*, this being the name applied to almost any design near the border or opening of a basket. This, however, is one of the rare instances in which such a border or finishing design is not a row of small rectangular figures. Eastern informants gave the names of this design as dzīyō'dzīyō and katī'yō'tī'yō, both meaning *zigzag*, xama' dītīp, *mark sharp*, and eō bax kama, *east this mark*. One informant also called it xatī'yōtī'yō xōtoagan, *zigzag, running along-in-pairs.*

The zigzag design shown in fig. 192 was found in use as the central element of a complex diagonal pattern of large triangles, similar to the pattern shown in fig. 55. The entire pattern was called by Northern Pomo informants datō'ī kata dilē kaa'i-kama daienga, *design empty in-the-middle crow-foot (or track) placed-close-together-in-a-row*. By another Northern informant the name tsūhū'n, for which no translation was obtained, was given. Among the Northern, as well as among the Central Pomo this design element alone

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was called *crow-foot (or track).* Among the Eastern Pomo it was given the name which has heretofore been roughly translated as *stretcher.* Two names for the pattern as a whole were obtained among informants of this division of the Pomo, xaitsa'kai xō''nawa kaga gadil, *stretcher on-both-sides arrowheads passing along,* and xaga' dilē gai xaitsa'k kama, *arrowheads in-the-middle gai stretcher mark.*


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194

In figs. 193 and 194, both of which are of comparatively rare occurrence, are shown two other designs which are usually called by all informants *zigzag.* Some Northern informants have given certain examples of these designs the name *deer-back,* biceē'-maō as have also some Eastern informants. Central informants usually called them *zigzag,* though kaa'i-kama, *crow-foot (or track)* was also used.

Diamond Shaped Elements.

Designs composed of diamond shaped figures with their long axes horizontal, such, for instance, as those in figs. 195, 196 and 197 are quite frequently met with, the last, however, being the least uncommon of the three. The design shown in fig. 195 is called by the Northern Pomo *turtle-back,* kawī'na-teīdik, and by the Central and Eastern Pomo kawī'na-ūtea and xana'dīhwa-kōī, respectively, both terms signifying *turtle-neck.* One Eastern informant added lik, signifying *band,* to the name turtle-neck. Central informants also called this design *acorn-head (or cup),* pdū'-ena, though this name is more frequently applied to the designs seen in figs. 196 and 197. One Northern informant called this design datī'pka datōī, *sharp-points design,* and one Central informant, who evidently considered this a modern design, gave the name wada'ha teī. Wada'ha was defined by this informant as the name given to the Spanish game of *cards* and the design was said by her to


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have been taken from these cards. Most informants, however, claimed this as an aboriginal pattern.

The design shown in fig. 196, consisting of lines crossing in such a fashion as to inclose white diamond shaped spaces, is named with regard to both the crossing lines and the inclosed blank areas. Here as elsewhere, the only means of making a diagonal line is by a series of small rectangular figures, which result in an irregular step shaped line. These crossing lines of small rectangles are called by the Northern Pomo bicē'-meō mina-datē'kama, *deer-back crossing*. By the Eastern Pomo these lines are called bicē'-maō wīnalīhempke, *deer-back crosing*, or bū'-dilē wīnalīhempke, *potato-forehead crossing*. They may be conceived of as zigzag lines instead of deer-back or potato-forehead designs, in which case their name is dzīyō'dzīyō wīnalīhempke, *zigzag crossing*. One informant of the Central dialect also called this design *zigzag crossing*, tsīyō'-tsīyō ūnaLiū. Most Central informants, however, gave the name *acorn-head (or cup)* pdū'-ena, referring more to the inclosed diamond shaped spaces than to the lines themselves. Some Central informants gave the compound name *deer-back acorn-head (or cup)*, pcē'-meō pdū-ena. Northern informants also named the diamond shaped space kawī'na-tcīdik, *turtle-back*, and Eastern informants named it kana'dīhwa-kōī, *turtle-neck*. One Eastern informant gave the compound name kana'dīhwakōī bū-dilē wīnalīhempke, *turtle-neck potato-forehead crossing*.

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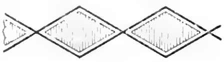
In fig. 197 is shown a design which is practically the negative of 196. By Northern informants this pattern was called datō'ī kata dilē kawi'na-tcīdik, *design empty in-the-middle turtle-back*. Datō'ī kata refers to the triangular figures along the sides of the pattern and kawī'na-tcīdik to the diamond shaped figures included between these lines of triangles. These diamond shaped figures were also called by another Northern informant dapō'kka, *large-spots*. Central informants called this pattern simply pdū'-ena and pdū-ena etot, *acorn-head (or cup)* and *acorn-head (or cup) band*, thus making no particular mention of the triangular figures of the

197

pattern. Eastern informants gave the names kaca'ieai wīnalīhempke, *butterfly crossing*, which refers to the large triangular figures, and dzīyō'dzīyō xōldabēhmak, *zigzag meet*, referring to the crossing white lines. The name bū-dilē-ūī, *potato-forehead eye*, was also given by some informants as the name for this pattern.

The diamond shaped pattern shown in fig. 198 has been found in but a few instances. It is generally considered by informants practically the same as those in figs. 196 and 197. Certain Northern informants gave the name datī'pka xōltū dzīyō'dzīyo cīten, *sharp points on-both-sides zigzag straight-band*, the important part of the design according to the Indians being the lines bordering the diamond shaped figures. Central informants noted these bordering lines in a different way, calling them kamtitalī-ū'ī-kūwī, *killdeer-eye-brow*, a name said to be derived from the dark line over the eye of that bird.



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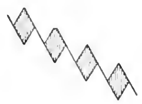
In figs. 199 and 200 are shown diamond shaped designs which are of very rare occurrence. Both were called new or white man's designs by certain informants of all three dialects, but by other informants Indian names were given, though all seemed to consider them not aboriginal designs. Northern dialect informants called the design of fig. 199 dapō'kka, *large spots*, datī'pka, *sharp points*, and datōī sīsī'sīsi, *design small-figures*. Informants of the Central division gave the names katca'-mtip, *arrowhead-slender*, katca ō'pit-ai, *arrowhead sharp pointed (plural)* katca kapōkpōkō, *arrowhead spotted*. In cases where these figures occur singly or in what has been termed individual arrangement, they were called kapō'kpōkō tatū *spotted single (or one)*. Eastern informants also connected this design with the arrowhead, calling it xaga'-mīset, *arrowhead-sharp*. Northern informants called the design shown in fig. 200 datōī teadō'lai,

design globular (plural). Some Central informants gave the name katca kapō'kpokō, *arrowhead spotted*, while Eastern informants gave the name kama dītas, *mark dot.*

Diamond shaped figures arranged with connecting lines such as are shown in fig. 201 were called by the Northern Pomo *grasshopper-elbow*, cakō'-bīya, as well as dīse't-ka, *crossed*, datōī bīyō'bīyō, *design little pieces*, and datīpka, *sharp points.* Central and Eastern informants usually gave simply *zigzag* as the name of this design. One Central informant, however, gave the name katca' lala tsīyō'tsīyō kaden, *arrowhead in-the-middle zigzag follow-up*, while one Eastern informant gave xaga' dilē dai dzīyō'dzīyō gadil, *arrowhead in-the-middle along zigzag passing-along.* This design has been found upon only a few baskets.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The design of squares in fig. 202 was called by the Northern Pomo *turtle-back*, kawī'na-tcīdik; by the Central Pomo turtle-neck, kawīna-ūtca, and *acorn-head (or cup)*, pdū'-ena; and by the Eastern Pomo *turtle-neck*, kana'dīhwa-kōī. One Eastern informant also gave the name xaga' gañeaiyaūhmak, *arrowheads interlocking (or sticking-through-between-one-another)*. Only two examples have thus far been found of this design.

One example of the design of hollow squares shown in fig. 203 has been found. This was called by Central Pomo informants pdū'-ena, *etot*, *acorn-head (or cup) band*, and by Eastern informants bū'-dilē-ūī, *potato-forehead-eye.*

A couple of instances of a design like that in fig. 204 have been found on baskets of the diagonal-twined weave. They appear as white line figures within a large triangle as is shown in pl. 16, fig. 2. By Northern informants this design was called dapō'dapōka, *spotted*, or simply daū, the name usually applied to the break in a horizontal band of design. Central informants called it pdū'-ena, *acorn-head (or cup)*, and tsīyō'tsīyō, *zigzag.*

Eastern informants gave the name dzīyō'dzīyō wīnalīhempke, *zigzag crossing.*

In figs. 205 to 209 are shown five designs which are by Northern informants usually called *turtle-back,* kawī'na-tcīdik, and by Central and Eastern informants *turtle-neck,* kawī'na-ūtca, and kana'dīhwa-kōī respectively. The design of fig. 205 is called by the Central Pomo pdū'-ena, *acorn-head (or cup)* and on account

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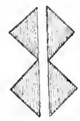

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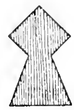

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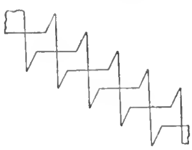
of the crossing lines which are of necessity composed of small rectangular figures, the name peē'-meō, *deer-back* is also given, sometimes the two being combined into peē'-meō pdū-ena, *deer-back acorn-head (or cup);* and Central informants also gave peē'-meō ūnaliū, *deer-back crossing.* By Eastern informants bū'-dilē wīnalīhempke, *potato-forehead crossing,* was given as one name for this design. One Eastern informant gave as the name of the design of fig. 207 kana'dīhwa-kōī dilē dūta'p gīwal, *turtle-neck in-the-middle wide-mark running-along.* All the designs called turtle-neck by Eastern and Central Pomo informants are usually called turtle-back by those of the Northern dialect. One informant, however, gave the name kawī'na-kū', turtle-neck, to the design shown in fig. 209. Similarly, an Eastern informant called the design of fig. 205 xana'dīhwa-*kidī, turtle-back.*

The rectangular design with points shown in fig. 210 has been called *turtle-foot,* kawīna-kama, and kana'dīhwa kama. It was claimed by most informants to be a new or *white man's design.* Some informants claim that there is no design called turtle-foot, while one Northern informant described a turtle-foot design, consisting of a more or less circular figure with four or five projecting points about it.



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Quail Plume Elements.

The designs shown in figs. 211 to 222 show various simple and complex forms of the *quail-plume design.* These various designs take their names from the club-shaped plume of the California valley quail, *Lophortyx californicus.* The quail plume is called by the Northern and Central Pomo caka'ka kēya, and by the Eastern Pomo cag'ā'x-xe or caka'ga-ke. This is, on the whole, the most common of the animal designs used by the Pomo and is the only one to which the Pomo attach any realistic significance. The element itself always bears the name quail-plume, but the names of the complex patterns vary greatly according to the many and varied other elements with which it is combined. In fig. 211 is shown the most simple form of the quail-plume design, in which the plain quail-plume figures appear uncombined with any other design elements. In this particular and most typical case the vertical line or stem of the quail plume is narrower than the horizontal line. In some cases, however, the two lines are of the same width. In figs. 212 to 215 are shown four patterns composed of quail plumes combined with straight lines. These were called by the Northern Pomo simply *quail-plume broad-band*, caka'ga-kēya datsa'ibanem. By the Central and Eastern Pomo, however,

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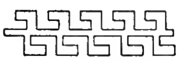

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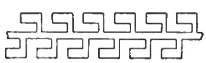

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more descriptive names were given, as follows: *striped-watersnake band side quail-plumes*, msa'kale *ctot* tūl caka'ga-kēya, by the Central Pomo, and *striped-watersnake and (or with) quail-plumes*, xalū'tūduk na cag'a'x-xe, *striped-watersnake in-the-middle gaiya quail-plumes*, xalū'tūduk dilē gaiya caga'ga-xe, *quail-*

plumes in-the-middle gaiya striped-watersnake, caga'ga-xe dilē gaiya kalū'tūduk, and *striped-watersnake quail-plumes on-both-sides passing-along*, kalū'tūduk cakaga-xe kō'nawa gadil, by the Eastern Pomo. Of these four designs, the one shown in fig. 214 is the most common, though none of them occur very frequently.

The design shown in fig. 216, which as been found but once, was called simply quail-plumes. One informant stated that the rectangular figure, in the middle was started for an arrowhead but was never finished.


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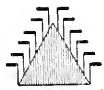
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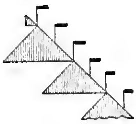
In fig. 217 is shown a design consisting of a large triangle or arrowhead, the sides of which are bordered by quail-plumes. This design which occurs quite frequently was called by Northern informants datō'ī kata xōltū cakaga-kēya daien'na, *design empty on-both-sides quail-plumes placed-close-together-in-a-row*, and by the Central Pomo katca'-dalaū caka'ga kēya kōwaldakaden, *arrowhead-half quail-plumes following-on-the-outside*, katca'-dalaū caka'ga-kēya, *arrowhead-half quail-plumes* or caka'ga-kēya katca, *quail-plumes arrowhead*. In cases where the triangle is very sharp-pointed, the name given was katca'-mset tōl caka'ga-kēya, *arrowhead-sharp on quail-plumes*. The following names were obtained for this design from Eastern informants: xaga' xō'nawa caka'ga-xe gadil, *arrowhead on-both-sides quail-plumes passing along*, xaga' dile gaiya caga'ga-xe xama, *arrowhead in-the-middle gaiya quail-plume mark*, and xaga'na caga'ga-xe, *arrowhead and (or with) quail-plumes*. A band or circle of these arrowheads with quail plumes such as is shown in fig. 30, is occasionally found, particularly on large woven baskets. The name given to such a banded pattern is usually the same as the name of the single triangle with quail plumes, except that sometimes by the Eastern Pomo the name *butterfly* instead of arrowhead is given to the large triangles.

Diagonal rows of large triangles with quail plumes upon the upper side of the row, as shown in fig. 218, are occasionally found.

These are called by the Northern Pomo datō'ī kata tū caka'ga-kēya daienga, *design empty side quail-plumes placed-close-together-in-a-row*, and by the Central Pomo caka'ga-kēya katca, *quail-plumes arrowheads.* By the Eastern Pomo they are called xaga' dilē gaiya caga'ga-xe xama, *arrowheads in-the-middle gaiya quail-plumes mark.*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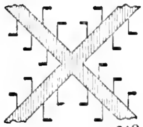
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Now and then crossing lines with quail plumes on their sides, as shown in fig. 219, are found. These designs were called by Northern informants datō'ī datapan tū caka'ga-kēya daienga, *design large area side quail-plumes placed-close-together-in-a-row* and caka'ga-kēya mīna-datē'kama, *quail-plumes crossing.* Central and Eastern informants also gave the name *quail-plumes crossing*, in the first case caka'ga-kēya ūnaLiū, and in the second caka'ga-xe wīnalīhempke.

Fig. 220 shows one of the more unusual quail-plume designs.


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This was called by the Northern Pomo tsīyō'tsīyōka tū caka'ga-kēya daienga, *zigzag side quail-plumes placed-close-together-in-a-row.* By another informant it was called kale datsū'ttcīka, *white compressed*, and ditce'kka, the name of a game in which a slender wooden or bone skewer is thrust through a string of fish vertebrae as it moves through the air. By Central informants this design was called, in addition to *quail-plume*, katca'k-kasūltak, *arrowhead-long*, and katca'k katūk, *arrowhead elbow (?).* Informants of the Eastern dialect gave the names caga'ga-xe, *quail-plume*, caga'-ga-xe gabil, *quail-plume long*, and xalū'tūduk kama, *striped-watersnake mark.*

In figs. 221 and 222 are shown designs commonly called *quail-plume* which also occur rarely. In addition to quail-plume, the design shown in fig. 221 was called by one Northern informant bita'mta, *mosquito*, and by another dikō'tka, which is another name for zigzag, meaning in the strictest sense *wavy.* By one

Central informant this design was called kaa'i-kama, *crow-foot (or track)*, and by another ctot mka'litcai, *band scattered (plural)*. One Eastern informant called this design caga'ga-xe batīl

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mahwak xama, *quail-plumes batilmahwak mark*. Some informants claimed both these designs to be modern or *white man's designs*.

Miscellaneous Elements.

The design, resembling a zigzag, shown in fig. 223 was called by some Northern informants and by all Central informants kaa'i-kama, *crow-foot (or track)*. By Eastern informants the names given were dziyō'dzīyō, *zigzag*, and xaitsa'k xama, *stretcher mark*. This design, like the one in fig. 192, has thus far been found upon but one basket and, also like that figure, occurs as the middle element in a diagonal pattern of large triangles. The pattern as a whole is called by the Eastern Pomo xaga' dilē gaiya dzīyō'dzīyō gadil, *arrowheads in-the-middle gaiya zigzag passing along*, and dzīyōdzīyō xōtcagan xō'nawa xaga, *zigzag running-along-in-pairs on-both-sides arrowheads*. It was called by Northern informants datō'ī kata dilē datōī maa daien, *design empty in-the-middle design acorn collect*.

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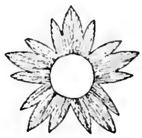
In figs. 224 and 225 are shown forms of a design commonly called *sunfish-rib*, tsawa'l-msak by the Central Pomo. Northern informants called the design of fig. 224 datō'ī bīyōbīyō, *design little-pieces*, though most informants of all three divisions considered it a new or *white man's design*. These designs have been found in but one instance each.

In fig. 226 is shown a wing-like design called by some of the Northern Pomo kata'talak-ca datōī, *bat's-arm (or wing) design.* This design has so far been found in only one case and was claimed by Central informants to be a new or *white man's design,* while Eastern informants gave it the name *arrowhead* or *arrow-head-half,* xaga' or xaga'-daLaū.


226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228

Fig. 227 shows a design which has also been found in but one instance. By one Northern Pomo informant this design was called katcak dase'tka, *arrowhead crossing,* and by another kat-ca'-mīset, arrowhead-sharp. One Northern informant gave the name *bear-foot (or track),* bita'-kama, to each one of the five large divisions or lobes of the figure. Eastern informants gave the names xaga' daset *arrowhead barbed,* and bī'ya kama, *elbow mark.*

There are occasional instances of star shaped designs with from four to several points. Such a design, a six pointed star, is shown in fig. 228. The largest number of points yet found is ten. Designs of this kind were usually called zigzag by informants of all three divisions. One Northern informant spoke of them as *zigzag circle,* tsīyō'tsīyōka tcadamūl. Central informants gave also the names *star* and *starfish,* kaa'mūl and stcik, and one Eastern informant gave the name star, ūyahō'.


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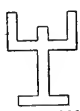
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231

The designs shown in figs. 229, 230 and 231 were, in most cases, called new or *white man's designs.* Indian names, however, were given by several informants for these. One Northern informant called the design in fig. 229 datō'ī dītaska, *design spotted.* One Central informant called it kawī'na-ūtca, *turtle-neck,* and the names kalū' kama, *blank mark,* kaca'icai, *butterfly,*

and yanī'ya kama, *calico (a term derived from the Spanish) mark* were also obtained. One Northern informant gave kī'-*t*ana datōī *crab-hand (or claw) design,* as the name for the design shown in fig. 230. The design shown in fig. 231 was called by some Northern informants datī'pka datōī, *sharp-points design,* and katca, *arrowhead,* by some Central informants. One Eastern informant called this design, kama' dagol, *mark foolish (or nonsensical).*

There are various other new or white man's designs, such, for instance, as those shown on the upper four figures of pl. 29, which presents four different sides of the same basket. Here, although there are many separate designs, there are no two alike. Such designs are almost never given aboriginal names, but are simply called new, new style, or *white man's designs.* Other examples of these white man's designs are shown in figs. 5 and 6 of the same plate. The terms signifying new among the Central and Eastern Pomo are cūwē' and ciwē' respectively. White man is called in all three of the Pomo dialects here treated masa'n. Base't is the term in the Central dialect meaning bad or ugly and is often applied to an ill-shaped figure which resembles some aboriginal design. Among these new fashioned or white man's designs, the human figure such as is shown in pl. 18, fig. 4, is noteworthy, as the Pomo formerly never used the human figure as a decoration for their baskets. In addition to being called new or white man's design, this figure is also sometimes called tca by the Northern, tcatc by the Central, and gaūk by the Eastern Pomo, all three terms signifying man.

PATTERNS.

As before stated, in considering Pomo basket designs and their names, a sharp distinction must be made between the design element, the simple elemental figure, and the pattern as a whole, the more complex figure composed of one repeated or two or more combined elements. In discussing the designs shown in figs. 1 to 231 design elements have been mainly treated, the various forms of the same element being, as far as possible, shown in these figures. The names of such design elements are very simple terms

referring to animate objects, plants, natural or artificial objects, and geometric figures. The terms applied to complex patterns are compounded from these simple names of elements and are not in the nature of true simple names but are more of descriptive phrases which mention all the important elements constituting the complex pattern and give, in the main, the relation in which each stands to the other.

Such complex patterns may be composed of a single element repeated over and over again, as, for instance, superimposed rows of triangles, such as are shown in figs. 22, 23, 24, and 45, superimposed rectangles such as are shown in figs. 75, 81, and 82, or numerous parallel rows of rectangles such as those shown in fig. 95. Such a pattern is usually called by the name of the single element of which it is composed and these names have been treated in speaking of the design elements and their names. It should, however, be noted that these names of elements do not often occur unaccompanied by modifying terms, but usually have associated with them such qualifying and descriptive terms as crossing, double, and so on, descriptive of obvious peculiarities of form, size, number or arrangement of the elemental designs or of the larger figures formed by the combinations of elemental designs. An example of this is shown in fig. 97, which may be called either deer-back or potato-forehead crossing, or deer-back or potato-forehead acorn-cup, the last name arising from the diamond-shaped figure formed by the crossing lines of rectangles.

There are many complex patterns which are composed not of a single repeated element but of two or more different elements combined into a complex whole. Patterns of this sort are given complex names in which the chief, at least, of the design elements are mentioned, and the relations in which the constituent elements stand to one another are given, thus making the term by which such a pattern is designated a descriptive phrase, rather than a simple name. Informants differ somewhat in naming such patterns, some giving names much more fully descriptive than others; but none of them stop with a simple name such as is applied to a design element. The most skillful basket makers almost invariably give long descriptive phrase-names to their patterns, while those who seem less conversant with basketry and

basket-making neglect to mention in their names the finer distinctive features of the pattern. The complex descriptive names must therefore be considered the typical and proper names for such patterns.

Of these more complex patterns those consisting of large triangular figures combined with various other elements are the most common. These may occur either in a diagonal or a horizontal arrangement, each of these methods being found in about equal numbers.

DIAGONAL OR SPIRAL PATTERNS.

Triangles with Zigzags.

Among the diagonal patterns the double row of large isosceles triangles with some form of zigzag through its middle is one of the most common. Such patterns are shown in pl. 18, fig. 2, pl. 19, fig. 2, and pl. 22, fig. 1. Practically all diagonal patterns are arranged so that if followed from the bottom of the basket upward, they progress toward the left. The diagonal rows of triangles which form the chief elements are therefore those shown in figs. 18 and 20. Between these may appear almost any of the various forms of zigzag shown in figures 169 to 175, and 178 to 180. Any such combination of these elements is usually called by the Northern Pomo datō'ī kata dilē tsīyō'tsīyō cīden, *design empty in-the-middle zigzag lead.* Some Northern informants gave the same name but omitted the last term. One informant gave the name tsīyōtsīyō data'pka, *zigzag large-area* upon one occasion, and others gave datōī kata dilē cakō'-bīya datōī, *design empty in-the-middle grasshopper-elbow design,* and datōī kata dilē kaa'i-kama daien, *design empty in-the-middle crow-foot (or track) collected,* in cases where the particular kind of zigzag used to fill the middle of the pattern resembled the elemental designs called grasshopper-elbow or crow-foot (or track) respectively. Central Pomo informants gave these patterns the names katca lala ka'tīyōtīyo tcūwan, *arrowheads in-the-middle zigzag stripe,* katīyōtīyō mtca'kōlai lēLan, *zigzag mtcakolai in-the-center,* ka'-tīyōtīyō katca, *zigzag arrowhead,* and katīyōtīyo lēLan, *zigzag in-the-center.* Eastern Pomo informants gave xaga' dilē gaiya

dzīyōdzīyō, *arrowheads in-the-middle, gaiya zigzag,* xaga-daLau xam dzīyō′dzīyō eūdil, *arrowhead-half among zigzag lead,* and dzīyō-dzīyō xo′′nawa xaga, *zigzag on-both-sides arrowheads.* In cases where the zigzag approaches nearly the form of the diagonal line of rectangular figures called deer-back, the pattern may be called xaga xam biceē′-maō, *arrowheads among deer-back,* or xaga dilē biceē′-maō, *arrowheads in-the-middle deer-back.* Similarly, if the zigzag is composed of figures resembling those called by the Eastern Pomo goose-excrement, the pattern may be called xaga dilē gaiya Lal-a-pa kama, *arrowheads in-the-middle gaiya goose-excrement mark.*

Of the combinations of triangles with zigzags above mentioned the one shown in pl. 22, fig. 1 is probably the most common, while that shown in pl. 18, fig. 2 is rarely met with. In this, there is really a third element, the small sharp points which project inwards from the sides of the large triangles. These, however, were not mentioned by any of the informants, the names given for this pattern being the same as for a similar pattern without these sharp points. Diagonal patterns composed of large triangles and zigzags such as those just mentioned are usually found in baskets of the twined weaves, though coiled baskets such as those shown in pl. 18, fig. 2, and pl. 19, fig. 2 are occasionally found with these patterns. Usually, these patterns have a single zigzag in the center, though a few cases, such as the one shown in pl. 19, fig. 2, have been noted where double zigzags are used.

Triangles with Rectangles.

Another diagonal pattern which is frequently found is the double row of triangles with one or more rows of rectangular figures, often squares, through its middle. Examples of such patterns are shown in pl. 18, figs. 3, 5, 6, and pl. 19, fig. 1. These patterns are called by the Northern Pomo datō′ī kata dilē bitūmtū daienga, *design empty in-the-middle ants placed-close-together-in-a-row,* datō′ī kata dilē datcēdatcenka, *design empty in-the-middle datcedatcenka,* datō′ī kata dilē eīkīkītinka, *design empty in-the-middle extending,* and dapī′dapīka kateak nētak, *small-figures arrowheads throw.* Central Pomo informants gave these

patterns the names pcē-meō lēLan katca, *deer-back in-the-center arrowheads*, katca pcē-meō lala tcūwan, *arrowheads deer-back in-the-middle stripe*, katca dalaū pcē-meō malada tcūwan, *arrow-head-half deer-back near stripe*, and pcē-meō katca, *deer-back arrowhead.* Eastern informants called them xaga' xam *tūntūn* gīwal, *arrowheads among ants running-along*, xaga' xam *tūntūn* dabel, *arrowheads among ants stir* (?), this name being applied to a pattern in which the center is filled with a double row of small rectangles. Other names are xaga' dilē gaiya dzīyōdzīyō kama, *arrowheads in-the-middle gaiya zigzag mark*, xaga' dilē gaiya *tūntūn* gadīl, *arrowheads in the-middle gaiya ants passing-along*, and bū'-dilē xō'nawa xaga, *potato-forehead on-both-sides arrowheads.* When the pattern consists of such elements as those above mentioned but arranged in crossing lines as shown in pl. 19, fig. 3, the name crossing is added to the above mentioned names, or shorter names mentioning the crossing of the lines of the pattern are used, as, for instance, pcē'-meō katca ūnaLiū, *deer-back arrowhead crossing* among the Central Pomo, and bū-dilē wīna'līhempke kama, *potato-forehead crossing mark*, among the Eastern Pomo. In any of these patterns, the space between the rows of large triangles may be filled either by a single or by a double row of rectangles, usually worked out in the colored fiber material as shown in pl. 18, figs. 5, 6, though sometimes in white as in pl. 19, fig. 1. These patterns occur quite frequently and are usually found on coiled baskets, being the only combination of diagonal rows of large triangles and other figures which are met with at all frequently upon coiled ware.

It occasionally happens that there are more than two rows of small rectangular figures occupying the central space between the double row of diagonally arranged triangles. There are instances where two or more rows of such a design element occupy the center of a double row of triangles which itself occupies the center of a double row of still larger triangles. Such a pattern is found in pl. 17, fig. 6, where crossing lines of this elaborate pattern are shown. Among the Northern Pomo such a pattern is called in full datō'ī kata dilē kateak dilē kale dapī'dapī diaenga datōī mina-da*tē*kama, *design empty in-the-middle arrowheads in-the-middle white small-figures placed-close-together-in-a-row de-*

sign crossing. By others it was given the shorter name bitū'mtū mina-datēkama, *ants crossing.* Central Pomo informants gave still simpler names for the pattern, as a whole, as, katca kapō'k-pōkō ūnaLiū, *arrowheads spotted crossing.* At the same time, however, they named the constituent elements separately. The large triangles on the lower sides of the crossing lines of the pattern are called tca'l-katca, *inward-arrowhead*, and those on the upper sides of the lines are called ko'l-katca, *outward-arrowhead.* The inner combination of small triangles and little dots is called tū'ntūn katca ūnaLiū lala, *ants arrowheads crossing in-the-middle.* Eastern Pomo informants gave such names as xaga dilē' gaiya gadil, *arrowheads in-the-middle gaiya arrowheads passing-along*, xaga dilē' gaiya tūntūn gadil, *arrowheads in-the-middle gaiya ants passing-along*, wīna'līhempke kama xam tūntūn, *crossing mark among ants*, and kama' paser wīnalīhempke, *mark tied-together crossing.* By one informant only was the design called zigzag. The name given in this case was simply dzīyō'dzīyō wīnalīhempke, *zigzag crossing.* As was stated when speaking of designs called ants (figs. 75 and 76), the name of such a design is dependent upon the size of the constituent rectangles. In the present case, these rectangles are very small indeed. In fact, they are here so small that they consist of but a single woof element each and are to be considered as mere dots of color on the white background. It is just such design elements, extremely small in comparison with the other constituent elements of the pattern, that are called ants. In these elaborate patterns where there is a double row of triangles within another double row of still larger triangles there is usually found but the one design element occupying the space of the central double row of triangles. In some cases, on the other hand, there is nothing at all placed here, the center being unoccupied except by a blank white line. Such a pattern is called by the Northern Pomo datō'ī kata dilē katca'k daienga dilē dakīkītinka, *design empty in-the-middle arrowheads placed-close-together-in-a-row in-the-middle scattered-along-in-a-line.* By Eastern Pomo informants it is called xalū'tūduk hna xaga-daset, *striped-watersnake and (or with) arrowheads-barbed*, dilē dagal kalū'tūduk tcadim, *in-the-middle dagal striped-watersnake tcadim*, and kalū'tūduk kama dilē.

striped-watersnake mark in-the-middle. Shorter names were given by Central Pomo informants, *viz.*, katca-mtīp kama, *arrowhead-sharp-pointed mark*, and katca-mti'l etot, *arrowhead-slender band.*

Triangles with Rhomboids.

Among the more commonly occurring patterns on Pomo baskets are those composed of two parallel rows of large triangles with one or two rows of rhomboidal figures filling the space between them. Examples of such patterns are shown in pl. 16, figs. 2, 3, 5, and in pl. 22, fig. 3. Northern Pomo informants usually gave the names datō'ī kata dilē katca'k daien, *design empty in-the-middle arrowhead collected.* Usually only triangular figures are called arrowheads, but in this case the sharp pointed rhomboidal figures are sometimes so called by the Northern Pomo. Another name for this pattern is datō'ī kata dilē datō'ī maa cīden, *design empty in-the-middle design acorns lead;* also datō'ī datī'pka dilē kateak daien, *design sharp-points in-the-middle arrowheads collected.* Central Pomo informants referred to these centrally placed rhomboidal figures by the name *spotted*, kapō'kpōkō, and called the entire design katca lala kapō'kpōkō teūwan, *arrowheads in-the-middle spotted stripe,* kapō'kpōkō katca lala teūwan, *spotted arrowheads in-the-middle stripe,* katca kapō'kpōkō, *arrowheads spotted,* and kapō'kpōkō lēLan, *spotted in-the-center.* In cases where these rhomboidal figures are so arranged that they very much resemble a zigzag, as in pl. 22, fig. 3, they are sometimes called by the Central Pomo ka'tīyōtīyō lala teūwan, *zigzag in-the-middle,* or ka'tīyōtīyō lēLan, *zigzag in-the-center,* or the name may be shortened to simply tsīyō'tsīyō kama, *zigzag mark.* One Eastern Pomo informant gave the name kapō'kpōkō lala slema teūwan, *spotted in-the-middle string stripe,* as the name of the pattern of pl. 22, fig. 3, thus in this name taking into account the presence of the narrow white line called string, while omitting to mention the large triangles. Eastern Pomo informants seem to have in most cases considered these diagonal lines of rhomboidal figures as zigzags and they usually gave these patterns such names as xaga' dilē gaiya xa'tī'yōtī'yō gīwal, *arrowheads in-the-middle gaiya zigzag running-along,* xaga' kama

dzīyōdzīyō, *arrowheads mark zigzag*, dzīyō'dzīyō xō'nawa xaga, *zigzag on-both-sides arrowheads,* and dzīyō'dzīyō-dīset, *zigzag-projecting.* Certain of these patterns, however, some informants did not consider as zigzags and gave such names as xaga' dilē gaiya bicē'-yaō, *arrowheads in-the-middle gaiya deer-teeth,* xaga' dilē gaiya bicē-maō, *arrowheads in-the-middle gaiya deer-back,* kaga' dilē gaiya bicē-to kama, *arrowheads in-the-middle gaiya deer-stand-in-mark*, dilē gaiya xaga gaūcaiyaū'hmak, *in-the-middle gaiya arrowheads interlocking,* and xaga' dilē gaiya La'l-a-pa kama, *arrowheads in-the-middle gaiya goose-excrement mark.* Patterns of this kind are confined almost entirely to twined basketry.

Triangles with Triangles.

A diagonal pattern is occasionally found consisting of two rows of large triangles with the space between them filled simply with one or two rows of small triangles. Such a pattern is shown in pl. 18, fig. 1. Patterns of this kind were called by Northern Pomo informants datō'ī kata dilē katca'k yō-wil, *design empty in-the-middle arrowheads downward*, and datō'ī kata dilē maa cīden, *design empty in-the-middle acorns lead.* Central Pomo informants gave the names katca'-mtil katca leLan, *arrowheads-slender arrowheads in-the-center*, and etū' katca katca-dalaū leLan, *coiled-basket arrowheads arrowhead-half in-the-center.* Eastern Pomo informants gave the name xaga'-daLaū dilē xacai-cai, *arrowheads-half in-the-middle butterfly.*

Triangles with Lines.

Baskets are occasionally found with patterns consisting of rows of large trangles with the central spaces occupied by one or more narrow lines. Such a pattern is shown in pl. 22, fig. 2. Some Northern Pomo informants called this pattern datō'i kata dilē kale cīte, *design empty in-the-middle white straight-lines.* In this pattern, however, the inner surfaces of the large triangles are serrated, so that it gives the appearance of a set of small triangular figures placed upon the sides of the large ones, which accounts for the fact that some Northern informants gave the names datō'ī kata dilē katca'k daien, *design empty in-the-middle*

arrowheads collected, and datō'ī kata tū katca'k daien, *design empty side arrowheads collected.* One Central Pomo informant gave the name katca' lala slema tcīyau, *arrowheads in-the-middle string tciyau*, while another gave the name msa'kale kama, *striped-watersnake mark*, and still another katca'-dalaū, *arrowhead-half.* Eastern informants gave the names xalū'tūduk xō'-nawa xaga kama, *striped-watersnake on-both-sides arrowheads mark*, xalū'tūdūk hna xaga-daset, *striped-watersnake and (or with) arrowheads-barbed*, and xaga-daLaū-daset, *arrowheads-half-barbed.*

Miscellaneous Patterns.

An unusual pattern is shown in pl. 22, fig. 2, in which short zigzags fill the space between two rows of large triangular figures, the zigzags being so placed that they are transverse to the general direction of the diagonal pattern. Northern Pomo informants gave this pattern the names datō'ī kata dilē kaa'i-kama daienga, *design empty in-the-middle crow foot (or track) placed-close-together-in-a-row*, datō'ī kata dilē datōī maa daien, *design empty in-the-middle design acorns collected*, and datōī datī'pka dile tsakōtsakōka, *design sharp-points in-the-middle zigzag.* Central dialect informants all gave this pattern the name kaa'i-kama, *crow foot (or track)*, stating that while they, in this particular case named the white zigzags, because they were the most conspicuous, the name applied equally also to the small colored zigzags separating them. Eastern informants gave the names xaga' dilē gaiya dzīyō'dzīyō gadil, *arrowheads -in-the-middle gaiya zigzags passing-along*, xaga' dilē cō bax gadil, *arrowheads -in-the-middle east this passing-along*, xaga dilē' gaiya Lal-a-pa kama, *arrowheads in-the-middle gaiya goose-excrement mark*, and dzī-yō'dzīyō xōtcagan xō'nawa xaga, *zigzags running-along-in-pairs on-both-sides arrowheads.*

Crossing Patterns.

Lines of pattern so arranged that they cross each other are found now and then upon Pomo baskets. Two such patterns, shown in pl. 19, fig. 3, and pl. 17, fig. 6, have already been discussed. These are very elaborate, particularly the second, which

is composed of three distinct types of elemental figures. While crossing patterns are usually elaborate like these, much more simple ones are sometimes found, such for instance as the one shown in pl. 28, fig. 1, in which double rows of triangular figures cross each other, the space between the triangles of each row being entirely blank. Northern Pomo informants called this pattern katca'k dilē dakīkītinka, *arrowheads in-the-middle scattered-along-in-a-line*, and katca'k mina-datēkama, *arrowheads crossing*. Central informants gave the names katca'-mtil ūnaLiū, *arrow-heads-slender crossing*. Eastern informants gave the names kalū'tūduk hna xaga-daset wīnalīhempke, *striped-watersnake and (or with) arrowheads-barbed crossing*, and wīnalīhempke dzīyō-dzīyō, *crossing zigzag*. In the first of these two names, the triangles are considered as arrowheads and the central line as the striped watersnake design, both of which are the usual conceptions for these elements. In the second name, however, the informants take no account of the white line in the middle but consider the double row of triangles as a zigzag. Central Pomo informants usually called plain white lines, such as are shown in this pattern, string, but they for some reason took no account of the white line through the middle of this pattern.

Bordering Triangles.

Upon many diagonal patterns composed of these large triangles combined with other design elements there are rows of still smaller triangles placed on the slanting outer margins of the large triangles and at a little distance from them, so that a narrow white line separates the large triangle from the row of small ones. Such rows of small edging or bordering triangles are shown in fig. 55, and pl. 22, fig. 1, and pl. 16, fig. 2. These are called by the Northern Pomo simply *arrowhead*, katca'k, or *arrow-head-sharp*, katca'-mīset. By the Central Pomo they are usually called *arrowhead-sharp*, katca-mset, or *arrowhead-slender*, katca'-mtil, and by the Eastern Pomo they are called *arrowhead-projecting*, xaga'-dīset, or *arrowhead-small*, xaga-xūt. These large triangles are also sometimes bordered with similar triangular figures which are joined directly to the large figures, thus making them a part of the large triangle itself. Two examples of such

triangles, one a very acute angled figure, the other much less so, are shown in pl. 18, fig. 3, and pl. 17, fig. 2. Both these points are called by the Northern Pomo katca'k-kasetka, *arrowheads-sharp-points,* by the Central Pomo katca'-mset, *arrowheads-sharp,* and katca'-mtil, *arrowheads-slender,* and by the Eastern Pomo xaga'-datīp, *arrowheads-sharp-points.* Such points, particularly the more acute angled ones, are found edging the insides of the double rows of large triangles. In such cases, some informants mentioned the sharp points themselves, while others mentioned the white zigzag, which is the result of the presence of these points in colored fibers. Some Northern informants gave the names datō'ī kata dilē dasī'dasīka, *design empty in-the-middle scattered,* and datōī kata dilē katcak daienga, *design empty in-the-middle arrowheads placed-close-together-in-a-row.* Central informants gave the name katca lala tsīyō'tsīyō tcūwan, *arrow-heads in-the-middle zigzag stripe,* and Eastern informants gave the names xaga dilē gaiya xaga-daset xama, *arrowheads in-the-middle gaiya arrowheads-barbed mark,* and xaga'-mīset xaga xō'-nawa gadil, *arrowheads-sharp arrowheads on-both-sides passing-along.*

HORIZONTAL OR BANDED PATTERNS.

Elaborate patterns arranged horizontally or in bands about the surface of a basket, as was mentioned in the general discussion of design arrangement, are met with very frequently, especially upon baskets of the several twined weaves. They are, however, found less frequently upon coiled baskets. Among the twined baskets also these horizontal or banded patterns are much more frequently found upon the large globose storage and cooking baskets and upon the plate-form baskets used for sifting and as general utensils, than they are upon burden baskets where the diagonal arrangement prevails. Occasionally, of course, a burden basket with a horizontally arranged pattern is found, as, for instance, pl. 22, fig. 6, which shows zigzag and rectangular elements of different kinds, each element being itself repeated again and again in the horizontal band about the basket, and none of them being combined with any other element into a complex pattern. There are many of these horizontal patterns which,

like the ones just mentioned, are composed of but a single element or perhaps two simple elements. Such figures are seen in pl. 17, fig. 3, in which the band near the top is composed of elements called *quail-plumes* and the lowest band is composed of quail plume elements separated by a narrow line called *striped-watersnake*. There are, however, many of the more elaborate horizontal patterns, the majority of which are composed of a double row of large isosceles right triangles such as is shown in fig. 25 combined with various elements, such as rhombodial figures, triangles, rectangles, zigzags, and others. Three of the more simple patterns composed of isosceles right triangles, the spaces between which are filled with smaller triangles, are shown in figs. 26, 27, and 31, and the names applied to them have been given in treating the subject of triangular design elements. Another example of a banded or horizontal pattern formed upon the large isosceles right triangles as a base, is shown in fig. 30, in which these large triangles are edged or bordered with what is called the *quail-plume* design. The names applied to this pattern by various informants have also been given in the part of this paper treating of triangular elemental designs. This pattern is also found in the uppermost band about the basket shown in pl. 16, fig. 4.

Triangles with Rhomboids.

One of the most commonly occurring of this class of horizontal or banded patterns is the one in which the spaces between the large triangles are filled with rows of rhomboidal figures. The baskets shown in pl. 17, figs. 1, 4, and pl. 16, figs. 1, 4, show typical examples of this pattern. Northern Pomo informants usually gave these patterns the name datō'ī kata dilē katca'k datsai-banem, *design empty in-the-middle arrowheads broad-band*, or datō'ī kata dilē katca'k daien, *design empty in-the-middle arrowheads collected*. In patterns in which the rhomboidal figures are white instead of colored, as is the case in pl. 17, fig. 4, they were called by some informants datō'ī kata dilē kale katcak daien, *design empty in-the-middle white arrowheads collected*. Here again it is worthy of note that the name arrowheads is applied to these rhomboidal figures instead of being restricted entirely to triang-

ular figures as is usually the case. Central Pomo informants universally called these rhomboidal elements *spotted*, kapō'kpōkō, and usually gave as the name for this pattern simply *spotted in-the-middle*, kapō'kpōkō lēLan. Some called them *spotted band*, kapō'kpōkō *ctot*. Like the Northern Pomo, they also distinguished between the patterns with ordinary colored rhomboidal figures and those with white rhomboids, calling the latter kalū' kapōkpōkō *ctot-blank spotted band*. In the case of a pattern in which the rhomboids appear with a white line running through their middle as is shown in pl. 16, fig. 4, the Central Pomo gave the name kapō'kpōkō *ctot* lala sle'ma tcūwan, *spotted band in-the-middle string stripe*. Eastern Pomo informants gave this pattern the names xaga dilē gaiya bicē-tō kama gadil, *arrowhead in-the-middle gaiya deer-stand-in mark passing-along*, bicē-tō xam *tūn-tūn* gadil, *deer-stand-in among ants passing-along*. That these informants gave the term ants in connection with these names is due to the fact that the white line which runs through the middle of the row of rhomboids is but a single stitch or warp stick wide, and is, in consequence of its diagonal trend, not entirely continuous but appears as a slightly broken line. Other names given for these patterns were xaga' dilē gaiya xama paser gadil, *arrowheads in-the-middle gaiya mark tied-together passing-along*, and dzīyō'dzīyō xaga xō'nawa dai, *zigzag arrowheads on-both-sides along*.

Triangles with Triangles.

Another class of horizontal or banded patterns which occurs quite frequently is the class of patterns which are combinations of large isosceles right triangles with smaller triangles of various kinds. Examples of these are shown in figs. 26, 27, and 28, and in pl. 20. The small triangles which border the edges of the larger ones are usually of the isosceles right triangle type but may be set with their apexes in any one of the several possible directions. The names applied to such patterns by the Northern Pomo are datō'ī kata dilē kateak daienga, *design empty in-the-middle arrowheads placed-close-together-in-a-row*, and datō'ī kata xōl*tū* datī'pka, *design empty on-both-sides sharp-points*. In one instance where fine broken lines similar to the ones shown in the

center of the rhomboidal figures in the band of design second from the top in pl. 16, fig. 4, occurred between the inner double row of small triangular figures, the name given it by Northern Pomo informants was datō'ī kata dilē katcak dilē dapīdapīka, *design empty in-the-middle arrowheads in-the-middle small-figures.* Central dialect informants called designs of this class generally katca'-dalaū *ctot, arrowhead-half band,* or katca-dalaū lē'Lan, *arrowhead-half in-the-center;* and in the case of the particular pattern shown in pl. 20, katca'-mset, *arrowhead-sharp,* and katca-mtil, *arrowhead-slender.* Eastern Pomo informants gave the names xaca'icai dilē gaiya xaga dzīyōdzīyō, *butterfly in-the-middle gaiya arrowheads zigzag,* and xaca'icai wīnalīhempke kalūtūduk kōldaiyaūhmak, *butterfly crossing striped-watersnake meet-together.* Some informants also gave such short names as xaca'icai-dīset, *butterfly-projecting,* and dzīyō'dzīyō-dīset, *zigzag-projecting.*

Triangles with Rectangles.

Banded designs consisting of a row of large isosceles right triangles, the spaces between which are filled with rectangular figures as is shown in the broad middle band of pl. 17, fig. 3, are occasionally found. These zigzag rows of rectangular figures are usually single, but double rows are occasionally found. The rectangles themselves may be of various proportions and here again the names applied to them vary according to the size of the rectangles in question, as has been already explained in treating of the design elements shown in figs. 74 to 98. In the cases of the particular designs concerning which informants have been questioned, this variation of the naming of the rectangular elements by different informants is worthy of consideration. Some of the Northern Pomo informants gave to patterns of this class the names datō'ī kata dilē datcē'datcenka, *design empty in-the-middle datcedatcenka,* and datō'ī kata dilē datōī maa cīden, *design empty in-the-middle design acorns lead.* Another Northern informant called the rectangular elements of this pattern bi*t*ūm*t*ū, *ants,* and another called them bicē'maō, *deer-back.* All Central informants gave the name pcē'-meō, *deer-back,* to these rectangular elements, usually giving as the name for the entire pattern

simply pcē′-meō, *etot, deer-back band.* Eastern informants gave more descriptive names but with the same variation in the names of the rectangular elements. The names applied to these patterns by them were xaga′ dilē gaiya *tūntūn* gadil, *arrowheads in-the-middle gaiya ants passing-along,* bū′-dilē dzīyōdzīyō xō′-nawa xaga, *potato-forehead zigzag on-both-sides arrowheads,* and bicē-tō dilē gadil xaca′icai, *deer-stand-in in-the-middle passing-along butterfly.*

Triangles with Zigzags.

A few cases of a horizontal band of large triangles separated from each other by white or colored zigzags such as those shown in figs. 156, 157, and 158, and the upper broad band about the basket shown in pl. 17, fig. 4, have been found, but these are on the whole the most rarely occurring patterns of this general class. Some informants gave simply the name *zigzag* to all such patterns but some of the Northern Pomo gave the name datō′ī kata dilē tsīyōtsīyō, *design empty in-the-middle zigzag,* and some Eastern informants gave a similar name xaga′ dilē gaiya dzīyōdzīyō, *arrowheads in-the-middle gaiya zigzag.* White zigzags included between the double row of isosceles right triangles such as is shown near the center of the basket in pl. 23, fig. 2, are very common. The name of such a design is in most cases the same as that which is given above but some informants give *grass-hopper-elbow* as the name for this sharp angled zigzag, as also for such patterns as are shown in fig. 147.

PATTERNS COVERING THE ENTIRE SURFACE.

In a large measure, elaborate patterns are confined to spiral and horizontal or banded arrangements, but there are certain cases in which the entire surface of a basket may be covered with a pattern which may be considered neither truly spiral nor banded in its arrangement but which at the same time, if looked at from another point of view, is not only both spiral and banded but crossing as well. Such, for instance, are the patterns shown in figs. 35 and 36, and also in pl. 22, fig. 4, and pl. 16, fig. 6.

There are no special names used by the Indians for this particular arrangement, the names given to patterns of this kind being the same as though they were arranged in any one of the ordinary manners. Similar to these is the arrangement such as is shown in pl. 16, fig. 3, which is generally considered by the Indians as banded.

As before stated, there are various combinations of design elements other than these elaborate patterns composed of isosceles right triangles and other elements, but typical examples of practically all of the remainder of these combinations are shown in the schematic figures given in the first part of this paper. To attempt to show every combination and variation in minute detail would be not only useless, since the names for similar though not identical combinations are the same, but it would be wholly impracticable as it would involve the illustration of a very great number of baskets. Though they may bear the same names and may be alike in all essential features, minor differences make it almost impossible to find two patterns which are in all respects identical. Nearly all of the more elaborate patterns have isosceles right triangles as the chief elements and typical examples of these have just been given, together with their descriptive names. The names of the less elaborate combinations, typical examples of all of which are shown in the schematic figures above referred to, are given in speaking of the various design elements.

ELEMENTAL NAMES.

There are in all fifty-four names of Pomo design elements which may be classified as follows: animate objects or parts of animate objects, plant names, names of artificial or natural objects, names of more or less geometric figures, miscellaneous names, and names entirely of modern origin, or if of aboriginal origin applied only to designs introduced in modern times. The following table shows the total number of names of each of these classes found in each of the Pomo divisions considered, the total number of these names in common use in each of these three divisions, and finally the total numbers found in all three divisions and the total numbers in common use in all three divisions.

	Total number N	C	E	In common use N	C	E	Total in all divisions	In common use in all divisions
Animate objects	16	15	11	10	10	8	23	12
Plants	3	1	2	1	1	1	5	2
Artificial and natural objects	3	3	3	2	2	2	6	4
Geometric figures	7	2	2	3	2	1	7	4
Miscellaneous	4	5	4	4	2	2	7	4
Modern	2	6	3	1	2	2	6	2
Totals	35	32	25	21	19	16	54	28
Truly aboriginal names	33	24	22	20	17	14	48	26

NAMES OF DESIGN ELEMENTS.

Animate objects	*Northern*	*Central*	*Eastern*
deer-back	bicē'-maō	pcē'meō	bicē'maō
striped-watersnake	mīsa'kalak masa'kalak	msa'kale	kalū'tūduk kalū'tūruk
quail-plume	caka'ka kēya	caka'ka kēya	caka'ga-ke cag' a'x-xe
ant	bitū'mtū	*t*ū'n*t*ūn	*t*ū'n*t*ūn
butterfly	kaca'icai	kaca'icai	xaca'icai
deer-teeth	bicē'-ō		bicē'-yaō
turtle-neck	kawī'na-kū	kawī'na-ūtca	kana'dihwa-kōī
turtle-back	kawī'na-tcīdik		kana'dihwa-kīdī
goose-excrement			La'l-a-pa
grasshopper-elbow	cakō'-bīya	cakō'-pīya	
killdeer eyebrow		kam*t*i'l*t*alī-ūī kūwī	
crow foot (or track)	kaa'i-kama	kaa'i-kama	
deer-elbow		pcē'-pīya	
sunfish-rib		tsawa'l-msak	tsawa'l-mīsak
mosquito	bita'mta		
starfish		stē'ik	
crab-claw	kī'-*t*ana		
turtle-foot	kawī'na-kama	kawī'na-kama	kana'dīhwa-kama
bat's wing	kata'talak-ca		
bear-foot (or track)	bita'-kama		
deer-breast-?	bice'-yee-nat		
deer-stand in			bicē'-tō
elbow	bīya'	katū'k, pīya'	biya', bī 'ya'
Plants			
potato-forehead			bū'-dile
acorn-head (or cup)	maa-ka'tōla	pdū-cna	
acorn	maa		
pine-tree	kawa'ca		
potato-forehead-eye			bū'-dilē-ūī

Artificial	*Northern*	*Central*	*Eastern*
arrowhead	katca'k	katca'	kaga'
arrowhead-half		katca'-dalaū	kaga'-daLaū
arrowhead-sharp		katca-mset	kaga'-mīset
arrowhead-slender		katca'-mtil	
inward-arrowhead		tca'l-katca	
outward-arrowhead		ko'l-katca	
arrowhead-sharp pointed		katca'-mtīp	
arrow-split open			xaga'-mīLaū
arrowhead-projecting			xaga'-dīset
string		sle'ma	
game (played with fish vertebrae)	datce'kka		
stretcher			kaitsa'kai xaitsa'k xaitsa'kai
tattoo	ha'ske		
star		kaa'mūl	ūyahō'
Geometric			
zigzag (by which is meant almost any crooked line or object)	tsīyō'tsīyō ka*t*īyō'*t*īyō tsīyō'tsīyōka dzīyōdzīyō tsakō'kakōka tsīkē'ga (?)	tsīyō'tsīyō ka't yō*t*īyō tsīyō'tsīyōka	tsīyō'tsīyō xatīyō'tīyō dziyō'dziyōka dziyōdziyō'
wavy	dīkō'tka		
large spots, spots	dapō'kka		
spotted	dapō'dapōka dapō'kpōkō dapō'dapō dī*t*a'ska		dapō'kpōkō kapō'kpōkō
spot or dot	dī*t*a's		dī*t*a's
small figures	dapī'dapīka sīsī'sīsī dapī'dapī		
little-pieces	bīyō'bīyō bīyō'bīyōka		
Miscellaneous			
initial design	caiyō'ī	caiyō'ī	caiyō'ī
finishing design	baiya'kaū	baiya'kaū	hī'baiyax
empty	kata'		
east-this-mark			cō'-bax-kama
east-place-from-mark		cō-ma-ke'kama	
daylight (?)		kaa'	
door	da'ū, hamaka'm	ham, ha'mda	hwa

Modern	*Northern*	*Central*	*Eastern*
whiteman	masa'n	masa'n	masa'n
new		cūwē'	ciwē'
cross		karū's	
cards (a game)		wada'ha	
calico		yanī'ya	
man (human being)	tca	tcatc	ka'ūk
design	datō'ī	dītcī', tcī	
mark	kama'	kama'	kama', xama'

Among these names there are two, elbow and daylight, which should be disregarded, as they are doubtful translations and do not appear to be logically connected with the designs to which they are applied. In that case the total number of design names in use would be fifty-two. In order to arrive at the total number of truly aboriginal names, six, which are due to white influence and classified here as modern design names, should be subtracted, thus leaving forty-eight aboriginal names.

So far as at present may be judged all these names are of truly Pomo origin, there being no evidence now at hand of borrowing by the Pomo from other people. No positive statements can, however, be made upon this point until more knowledge is available about the basketry of the peoples occupying the territory surrounding that of the Pomo.

Not all these names are used by the people of all three Pomo divisions. There are ten pairs of names which may be considered as equivalents, as follows: deer-back and potato-forehead; turtle-neck and turtle-back; goose-excrement and finishing design; grasshopper-elbow and deer-elbow; zigzag and wavy; large-spots, spots, and spot or dot; small-figures and little-pieces; empty and arrowhead; east-this-mark and east-place-from-mark. The presence of these equivalent names accounts in part for what appears superficially as a radical difference in designs in passing from one of the Pomo divisions to another. Of fully equal importance also are the differences in the qualifying terms used in the different divisions and particularly the variations in the uses of these qualifying terms by different informants. In addition to these names which are equivalent in their application, there are in each of these divisions a number which are not used in either of the other divisions and which have no equivalents, so

that the total number of names used by any one division alone is very much below fifty-two. In fact the largest number used by any one of the divisions is thirty-five, that used by the Northern. The Central and Eastern have respectively thirty-two and twenty-five. If from these be subtracted the names due to white influence and introduced in modern times, the Northern would have but thirty-three, the Central twenty-six, and the Eastern twenty-two names of strictly aboriginal origin. From the second number should be also subtracted the two doubtful names above mentioned, these occurring only in that division, thus leaving the total for the Central division only twenty-four.

Among these names there are many which are rarely met with. The number in common use among all three of the divisions under consideration is but twenty-eight, and two of these are names of modern origin, so that twenty-six truly aboriginal names are the only ones applied to the majority of the designs. Similarly each one of the divisions taken separately shows a comparatively small number of names in common use, the three divisions having respectively twenty-one, nineteen, and sixteen such names, of which one, two, and two respectively are names of modern origin, leaving the total numbers of truly aboriginal names in common use twenty, seventeen, and fourteen respectively for the three divisions.

A notable feature of these terms is the predominance of animal names. As is shown by the above mentioned table there are in all three of the divisions taken together twenty-three animal names of which twelve are in common use, this being three times as great a number as is found in any of the other classes of names and nearly one-half the total number of names commonly in use. In the main these names denote parts of the various animals, though some are simply names of the animate objects themselves. There are sixteen names of animate objects, as follows: deer, striped-watersnake, quail, ant, butterfly, turtle, goose, grasshopper, killdeer, crow, sunfish, mosquito, starfish, crab, bat, bear; and twelve terms relating to parts of the body, as follows: back, plume, teeth, neck, excrement, elbow, eyebrow, foot (or track), rib, claw (or hand), wing, breast (?). To these last should be added three other terms which appear in plant names, namely:

head, forehead, and eye, making a total of fifteen terms referring to parts of the body. The remaining names which are commonly in use have been here placed in four classes, in none of which however is there any considerable number. While the number of animal names commonly in use is twelve, the number of plant names commonly in use is but two, of artificial objects but four, of geometrical figures but four, and of miscellaneous objects but four, thus showing a very great predominance of animal names when compared with any one of the other classes.

As has already been shown, the various design elements are given names of special signification, such as names of animals, birds, plants, artificial objects, etc., but an inspection of the figures of the design elements and also of the patterns appearing in the plates will show that the designs to which these names are applied are not in most cases at all realistic. They are not intended by the Indians to be so, as is shown by their statements that they never attempted to represent realistically animals, trees, flowers, mountains, stars, thunder, lightning, etc. The Indians do not attach any realistic significance to them, except perhaps to the quail-plume design (figs. 211 to 222), which they assert really does look like the plume of the valley quail. It is also true that the Indians do not attach any religious significance to these figures. They are mainly decorative and seem in all cases to have been named from some real or fancied likeness to objects bearing the same names.

QUALIFYING TERMS.

The figures and plates and their descriptions show that, while the Pomo have only a comparatively small number of elemental design names, the variation in form and proportions of the design elements to which these names are applied is very great. The lack of names of elements is, in a great measure, compensated by the use of qualifying terms, which assists in differentiating designs which are similar, yet quite distinct one from another. These qualifying terms, which are applied chiefly to elemental figures, though some of them are applied also to patterns, may be divided into seven general classes. There are seventeen terms relating to form, five to direction, three to position,

three to size, four to color, five to number, and four to quality. There are also four terms of miscellaneous significance. The following table shows these terms and the particular dialectic divisions in which each is used.

QUALIFYING TERMS USED WITH ELEMENTAL NAMES.

Form	*Northern*	*Central*	*Eastern*
sharp	ditī'p, mīse't	mset	ditī'p, mīse't
slender		mtil	
barbed	dase't		dase't
sharp pointed, sharp point	datī'p	ō'pitai, mtīp	datī'p
sharp points.	datī'pka kase'tka		
projecting			dīse't
pointed	dītī'pka		
wide mark			dūta'p
drawn out	kala'tkaū	kala'tkaū	
large area	data'pan data'pka		data'p
split open			mīLa'ū
forked			bana'
compressed	datsū'ttcīka		
long		kasū'ltak kō'lai	bagi'l
short		ptcō'yai	
circular, circle	tcada'mūl	tcadō'tcadō	
globular	tcadō'lai		
Direction			
inward		tcal	
outward		kol	
upward	ū'yūl		kaiyūla'l
downward	yō'wil		
from (?)		ke (?)	
Position			
above		naū	
lower		yō	
pushed-over	dīka'tka		
Size			
big			tīa
small	bitcū'tcai		kūt, kū'dja, xūt
swelled or bulged		katsū'ttci.	

Color	*Northern*	*Central*	*Eastern*
black	katse′		
white	kale′		
blank		kalū′	xaLū′
Number			
half		balaū, balaū-ai, dalaū	daLaū
both	xōl		xa′lī
one (or single)		ta′tū	
three		sī′bō	
eye-half		ū′ī-balaū ūī-balaū-ai	
Quality			
ugly (or imperfect)		baset	
resembling		ī′tcai	ī′tcai
nothing			xale′l
foolish (or nonsensical)			dagō′l
Miscellaneous			
coiled-basket		ctū	
throw	nē′tak		
stir (?)			dabe′l
rub (?)	dana′		

Some of these terms are applicable to any and all design elements, while others are used only in connection with one or two. For instance, inward, outward, above, lower, slender, and sharp are used only with arrowhead. Further, many of these terms are used by the people of all three of the Pomo divisions investigated, while others are restricted to perhaps a single division. For instance, the terms inward, outward, above, and lower when used as qualifiers of names of elements, are employed only by the Central Pomo.

These qualifying terms show a predominance of terms relating to form, there being seventeen of them. This is to be explained by the fact that they are applied in most cases to single figures, not to combinations of figures as are the qualifying terms relating to patterns. The small numbers of terms of direction and of position are noticeable, but are to be expected by virtue of the fact that terms of these two classes belong logically with patterns or the combinations of two or more figures.

PATTERN NAMES.

Names of patterns, as has already been shown, are combinations of the names of their constituent elements, together with appropriate qualifying terms. In a great measure these pattern names are constant and uniform within the limits of any one of the Pomo divisions, so that the same phrase-name, consisting of the accepted names of the constituent elemental figures and the appropriate qualifying terms, is given in connection with any particular pattern by all informants speaking the same dialect. There are, however, very considerable differences in these phrase-names within the same dialectic area, due to the individual conception of the form or size of the design elements which go to make up the pattern as a whole. For instance, one informant might consider the small rectangles which form part of a pattern as of sufficient size to be called deer-back, while another might consider them so small as to require the designation of ants. Another source of variety in these phrase-names and one which is responsible for fully as great variation as this difference in individual interpretation of form or size of the elemental figures themselves, is the difference in the use of qualifying terms, of which there are a large number.

QUALIFYING TERMS.

Just as the greater number of qualifying terms used in connection with design elements are naturally descriptive of form, owing to the fact that the elemental designs are in most cases single figures, so the qualifying terms used particularly in connection with pattern names are indicative of relative position and spatial relations owing to the different combinations of elemental figures which go to make up the patterns. The differentiation of patterns depends largely upon the relative position and spatial relations in which the constituent elements stand one to another. As is shown in the following table, there are thirty-four of these terms giving these relations, and also mentioning the several methods of patterns arrangement employed by the Pomo. Some of these terms are used by the people of but one

of the Pomo divisions, while others are used by the people of all three divisions. Those most commonly occurring are crossing, in-the-middle, in-the-center, on-both-sides, collected, placed-close-together-in-a-row, and (in addition to) side, and on.

In addition to this large number of terms relating to position there are also qualifying terms relating to form and direction, there being five terms in each of these classes. Of these the terms band, broad-band, striped, and lead occur most frequently.

QUALIFYING TERMS USED WITH PATTERN NAMES.

Position	*Northern*	*Central*	*Eastern*
crossing	dase'tka minada*t*ē'kama minadatēkamū	ūna'Liū	wīna'līhempke
crossed	dīse'tka		
one on top of another	batcō'tama		
in the middle	dilē'	la'la	dilē'
in the center		lē'Lan	
on both sides	xō'l-*t*ū		kō''nawa xō''nawa
following on the outside		kōwaldakade'n kōwaldakadē'tan	
on the outside		kō'wal	
running along in pairs			xōtca'gan
going around			kadabe'mlī
going around and meeting	tcadī'mul tcacī*t*e'mūl		
meet	daiye'kamū daiye'tkamū		kōldaiyaū'hmak xōldabē'hmak
collect, collected	daie'n		
connected		c*t*e'l*t*ele	
interlocking	ka*t*e'ltaimaū		gaūcaiya'ūhmak
together		katcō'm	
tied together			pase'r
placed close together in a row	daie'nga		
scattered along in a line	dakīkī*t*i'nka dasē'sētenka		
scattered around in a circle	dasī'dasī-mūl		
scattered along	dakīkī*t*in		
scattered around	daki'tka dasī'dasī		
scattered	dasī'dasi dasī'dasīka	mka'liteai	
separated		kata'iiteai	
far-apart (?)		*t*aka'nma	

along			dai
above, upper	ū'yū		
close	kana'		
near		mala'da	
among			xam
side	*tū*	tūl	
stuck-on		tcil, tci'ltaū	
on		tōl	
and (or with)			hua, na
Form			
band		*ctot*	lik
broad band	datsai'-banem		
straight band	cīte'n		
stripe	cīke't, cīke'tka	tcūwa'k tcūwa'n	
straight line (or lines)	cīte'		
Direction			
passing along	da*t*e'n		gadi'l
running along			gīwa'l
extending, extended	cīkīkīti'nka		
follow up		kade'n kadē'tan	
lead	cīde'n		cūdi'l

As has already been shown, the number of names of elemental designs in common use among the Pomo when compared to the number of elements themselves is comparatively small. In all three of the Pomo divisions under consideration there are twenty-six truly aboriginal names in common use, and in any one of these divisions alone the number of such names does not exceed twelve. However, by combining the names of all or, at least, most of the elements in a complex pattern and by adding appropriate qualifying terms, the Pomo are able to produce descriptive phrase-names, by which they can adequately differentiate the most complex patterns. As before stated, however, these descriptive phrase-names differ to a certain extent according to the interpretation which the individual informant puts upon the various elements constituting the pattern and to the individual's conception of the relation in which these elements stand, one to another.

When compared with the design names found among certain other California peoples the Pomo have a large number, probably due both to linguistic diversity and variety of environment.

In the previous pages the names in use by three of the seven Pomo divisions only have been given, those of the other four divisions not being now available. While the people of these three dialectic divisions are quite closely related the differences between any two are very considerable, even amounting in some features of their speech to a true language rather than a dialectic difference. Under such conditions the people of any one of these divisions might from time to time modify a name held in common by all three, originate a new name, or allow one of the old ones to fall into disuse. In any of these cases the differences in language and the consequent difficulties of communication among the people would make the changed or new term slow to spread from one division to another. This difficulty of transmission would be still greater if the whole seven Pomo dialects, some of which are much more remotely connected one to another than the three considered, be taken into account. If the design names used by the people of all seven of the Pomo divisions were available it is probable that the present number, forty-eight, of truly aboriginal names would be increased, possibly as much as fifty per cent.

There are also very considerable differences in the topography and in the environmental conditions existing in different parts of the territory occupied by these three divisions of the Pomo. Their territory extends from the ocean to the crest of the inner or main range of the Coast Range mountains, and covers four distinct topographical zones, as has been pointed out in treating the topography of this region.* Under these conditions it is to be expected that the basket designs would be considerably affected, as is the case with various other important features of culture. Combining then these differences of natural environment with the linguistic diversity, conditions are given under which it is to be expected that a considerable number of design names would arise, and it is natural that the Pomo should have fully as great a number of elemental names as any other people inhabiting a like territory.

An inspection of the region inhabited by the Yurok, Karok,

* The Ethno-Geography of the Pomo and Neighboring Indians, Univ. Cal. Publ. Arch. Ethn., VI, 8, 1908.

and Hupa and of that inhabited by the Maidu is interesting in this connection. The former may here be considered together for, while they differ entirely in language, they live in contiguous territories and are a unit in culture. Their territory does not show so great diversity of environment as that of the Pomo but in their language they, like the Pomo, are in three groups. While lexically these languages are entirely different the peoples themselves mingled freely. In this respect, therefore, they are similar to the three Pomo divisions under consideration and like them collectively possess somewhere between forty and fifty design names.

The Maidu occupied a territory much larger than that of the three Pomo divisions and also much larger than that held by the three Northwestern peoples. They also are divided linguistically into three dialectic groups and their territory like that of the Pomo shows considerable diversity of topography and environment, since it extends from the broad plain of the Sacramento valley to the high Sierras. These great differences of elevation, with consequent differences of temperature, flora, and fauna, gave rise to an environment which, like that of the three Pomo divisions, is very diverse and must have influenced design names and other matters of culture to an appreciable extent. It is therefore not surprising that among the Maidu also there are in use something over forty design names.

Thus among the representatives of the three culture groups, the three Northwestern peoples, the Maidu, and the Pomo, concerning whose basketry there is information now available, and among whom the conditions of linguistic and environmental diversity are, to a considerable extent at least, comparable, the numbers of basket design names seem to be about equal and to range between forty and fifty.

In general, therefore, it appears that the Pomo possess fully as great a number of elemental names as do the Indians inhabiting any other territory of like extent, and it seems probable that the number is considerably greater than that to be found among other peoples with equal or greater territory but with more uniform environmental conditions and with less diversity of language.

CONCLUSION.

The fiber materials employed by the Pomo in their basketry are, with the exception of the bark of the redbud, taken from the roots of such plants as the sedge, carex, and pine. For the foundation material in coiling and for warp in twining the slender stems of the willow are almost exclusively used, those of the hazel being employed only in the extreme northern part of the Pomo region.

The use of feathers and beads in the ornamentation of Pomo basketry is one of its most characteristic features. The feathers are employed either for outlining designs which appear in fiber, or making the designs themselves. In the latter case the entire surface of the basket is thickly covered in such a manner that the background and pattern are brought out by the different colored feathers instead of by the fiber.

In technique Pomo basketry is characterized by great variety. Three different types, coiling, twining, and wickerwork, are found. Of coiling there are two forms, single-rod and three-rod; of twining there are seven, plain, diagonal, lattice, and two forms of three-strand twining, and two forms of three-strand braiding. While most other California peoples use one type of technique almost exclusively, the Pomo alone to a slight extent make use of wickerwork and employ very extensively both twining and coiling.

The forms also of Pomo baskets show great range. They vary in shape from the very flat plate-form to almost perfect spheres and to cones of various proportions. In addition to these a special elliptical or boat-shaped basket, a form rarely met with elsewhere, is quite frequently made by them.

The variety of pattern arrangements found among the Pomo is very striking. The predominating arrangement, especially upon twined baskets, is horizontal or banded. A considerable proportion of the baskets have their patterns placed diagonally. Comparatively few have patterns arranged so they cross one another, or so as to cover the entire surface of the basket in the manner shown in pl. 16, fig. 6. A very few coiled baskets have a vertical or an individual arrangement of their patterns.

Symmetry in the disposition of the patterns is to a large extent

lacking. Not only is there no such careful balancing of the parts of the horizontal patterns as is found in Northwestern California, but even such banded patterns possess a break in their continuity. This may be either very small or of considerable size and filled with a design quite different from that of the remainder of the pattern. Obviously no symmetry is possible in the crossing and individual arrangements. In the diagonal and vertical arrangements, however, the patterns are so placed at three or four equidistant points as to be symmetrical.

The ornamentation of Pomo basketry consists of a great number of complex and varied patterns each composed of simple design elements, such as lines, triangles, rectangles, rhomboids, etc. By various modifications of these simple elements a large number of forms of any one class are available for combination to make the complex patterns. By repeating a single element, or, as is more often the case, by combining several, a very elaborate pattern may be produced.

Similarly, the names applied to design elements and to patterns are of two different kinds. The former are simple terms derived from the names of animals, plants, artificial objects, etc. and are given by reason of some real or fancied likeness of the design to the object bearing the name. These simple names are qualified by various terms descriptive of form, size, position, color, etc. so as to be fairly exact designations. As patterns are formed by combining various design elements, pattern names result from the combination of the names of the various elements concerned. By means of additional qualifying terms the relation in which these various elements stand to one another is indicated.

It is thus not only possible to adequately differentiate the most complex patterns one from the other, but by this combination of element names and qualifying terms pattern phrase-names result which are so descriptive that it is possible for anyone acquainted with the subject to form a mental picture of the pattern from its name.

To these elaborate patterns composed of simple, largely geometrical elements, provided with purely descriptive names based upon some real or fancied likeness to objects bearing the same names, the Indians do not attach any religious or symbolic significance.

GLOSSARY.*

ai, plural suffix used with adjectives (N, C).
badjō′ tule (N).
bagi′l, long (E).
bag‘ō′, tule (E).
ba′iya-hakō, cylindrical fish-trap (C).
baiya′kau, finishing design. Also used in speaking of long stitches such as basting of cloth or in basketry, twining which covers two or more warp sticks like that about the rims of the baskets shown in pl. 21 (N, C).
bala′ū, half (C).
bala′ū-ai, half [plural] (C).
bam, willow stem (N).
bam-sa′i, diagonal twining (C).
ba′m-sūbū, three-rod foundation (N).
ba′m-tca, single-rod foundation (N).
bam-tūe′, plain twining (N, C, E).
bana′, forked (E).
bane′m, to set down or place an object (N).
base′t, ugly [or imperfect] (C).
batcō′, tule (C).
batcō′tama, one-on-top-of-another (N).
batī, hazel (N).
batī′bōom, hemispherical basket (N).
bati′lmahwak, ? (E).
batō′, basketry seed-beater (E).
batsī′ya, yellowhammer (N).
batū′, basketry seed-beater N, C).
bax, this (E).
bicē′, deer (N, E).
bicē′-maō, deer-back (N, E).
bicē′-ō, deer-teeth (N).
bicē′-to, deer-stand-in (E).
bicē′-yaō, deer-teeth (E).
bicē′-yee-nat, deer-breast-? (N).
bidjī′, burden basket [closely woven] (N).
bilī′ya, red-winged blackbird (N).
bis-yem, bracken, a black basket material (N).
bita′, bear (N).
bita′-kama, bear-foot [or track] (N).
bita′mta, mosquito (N).
bitcū′tcai, small [plural] (N).
bito′i-tsoi, burden basket [openwork of peeled rods] (N).
bitsū′l, small openwork storage basket (E).

* The alphabet used in this glossary is described in the present series of publications, VI, 51, 1908 (Ethno-Geography of the Pomo Indians).

bitūm'tu, ant (N).
bīya', elbow (N).
bī'ya', elbow (E).
bīyō'bīyō, little pieces (N).
bīyō'bīyōka, little-pieces (N).
bū, "Indian potatoes," by which is meant the bulbs, corms, and tubers of the various species of bulbous and tubrous rooted plants in which the Pomo region abounds (E).
bū'-dile, potato-forehead. [According to some informants this term refers to a protuberance on the upper surface of certain bulbs and corms called "Indian potatoes." Some other informants claim that the reference is to a protuberance on the under surface of these "Indian potatoes."] (E).
bū'-dile ūī, potato-forehead eye (E).
būgū', burden basket [closely woven] (E).
būka'l, conical fish-trap (N).
būm, starting knots used in twined basketry (N, C).
būxa'l, conical fish-trap (E).
ca, arm [or wing] (N).
ca'di, basket (E).
caga'ga, quail (E).
caga'ga-ke, quail-plume (E).
caga'ga-xe, quail-plume (E).
cag'a'x, quail (E).
cag'a'x-hakōi, quail-trap (E).
cag'a'x-ke, quail-plume (E).
cag'a'x-xe, quail-plume (E).
caiyō'ī, inital design (N, C, E).
caka'ga, quail (N, C, E).
caka'ga-hakōi, quail-trap (N, C).
caka'ga-ke, quail-plume (E).
caka'ga-kēya, quail-plume (N, C).
caka'ga-xe, quail-plume (E).
caka'ka, quail (N, C).
caka'ka-kēya, quail-plume (N, C).
caka'n, openwork basket [culinary type] (N).
caka'n-tīn, openwork basket [sifter type] (N).
cakō', grasshopper (N, C).
cakō -bīya, grasshopper-elbow (N).
cakō'-pīya, grasshopper-elbow (C).
cala'p, openwork basket [sifter type] (E).
ca'-mīdje, truncated cone fish-trap (E).
ca'-mtce, truncated cone fish-trap (C).
cat, basket (E).
ca'tanī, shell beads (E).
cateo'm, juniper (?) root, a white basket material (C).
cate'p, juniper (?) root, a white basket material (E).
cbū, coiling (C).

cee't, twining (C);
cylindrical basket [small] (C).
cee't-tcibūtcibū, spherical basket (C).
cibū', coiling (N).
cīde'n, lead [verb] (N).
cīke't, stripe (N).
cīke'tka, stripe (N).
cīkīkītin'ka, extending, extended. Applied to anything drawn out or strung out for a great distance; also to anything unraveled (N).
cīl, lark (C).
cīlō', elliptical or boat-shaped basket (N).
cīte', straight line; straight lines (N).
cīte'n, straight band (N).
cītsīn', three-strand twining; three-strand braiding (N).
ciwē', new (E).
cīyi'n, grape-vine, a binding material (N).
cna, head (C).
cō, east (C, E).
cō'bax-kama, east-this-mark. A name applied by the Eastern Pomo to certain patterns said by some to have been introduced into their basketry from that of the people living to the east of them.
cō'-ma, east-place (C).
cō-ma ke'kama, east-place from mark (C).
c*t*el'*t*ele, connected, hitched together (C).
c*t*i'n, grape-vine, a binding material (C, E).
c*t*o*t*, band (C).
ctū, coiling (C);
coiled-basket (C);
hemispherical basket (C).
ctū'-ptcī, basket of truncated cone form (C).
cūdi'l, lead [verb] (E).
cūsa's, diagonal twining (E).
cūse't, diagonal twining (N).
cūw'ē, new (C).
cūwī'rī, three-strand twining; three-strand braiding (E).
cwi'tki, three-strand twining; three-strand braiding (C).
dabe'l, stir (?) (E).
dagal, ? (E).
dago'l, foolish [or nonsensical] (E).
dai, along (E).
daie'n, collect; collected (N).
daie'nga, placed close together in a row. [When used in reference to design.] In general, to collect a number of objects together in one place (N).
daiye'kamū, meet [singular] (N).
daiye'tkamū, meet [plural] (N).
dakī'kī*t*in, scattered along; moving along (N).
dakīkī*t*i'nka, scattered along in a line (N).

daki'tka, scattered around (N).
dako', willow hoop (C).
dakō', willow hoop (N, E).
dala', plate-form basket (N, E).
dala'kan, plate-form basket [small] (N).
dala'ū, half (C).
daLa'ū, half (E).
dana', rub (?) (N).
dapī'dapī, small-figures (N).
dapī'dapīka, small-figures (N).
dapō'dapō, spotted (N).
dapō'dapōka, spotted (N).
dapō'kka, large spots, particularly if they are at considerable distances from one another (N).
dapō'kpoka, spotted (N).
dapō'kpōko, spotted (N, C).
dasē'sētenka, scattered along in a line (N).
dase't, barbed; sharp points [two or more points] (N, E).
dase'tka, crossing (N).
dasī'dasi, scattered or scattered around (N).
dasī'dasīka, scattered [either promiscuously or in a row] (N).
dasī'dasī-mūl, scattered around in a circle (N).
data'p, large area; wide mark (E).
data'pan, large area (N).
datapka, large area [of any shape] (N).
datcē'datcenka, ? (N).
datce'kka, the name of a game in which a wooden or other skewer is thrust through as many as possible of a string of fish vertebrae as the string is passing through the air.
da*t*ēkama, lie-on.
da*t*e'n, passing along (plural).
datī'p, sharp point; sharp-pointed (N, E).
datī'pka, sharp points (N).
datō'ī, design (N);
mark of any kind (N).
datsa'i, broad (N).
datsa'i-banem, broad-band. Literally broad placed or put on. It is used in reference to certain basket designs and is equivalent to broad band (N).
datsū'tka, ? (N).
datsū'ttcika, compressed. Strictly the compressing or squeezing of any soft material (N).
daū, space or opening in a pattern, literally door.
dem, cylindrical basket [small] (N).
dīka'tka, pushed over (N).
dikō'tka, wavy (N).
dilē', forehead; in-the-middle (N, E).
dīsa'i, redbud, a red basket material (E).
disai-tō'ts, redbud, a white basket material (E).

dīse′t, projecting; applied to any objects which stick up or project prominently (C,E).
dīse′ta, crossed (N).
dī*t*a′s, dot, spot, daub (N, E).
dī*t*as′ka, spotted or daubed more than once (N).
dītcī′, design (C).
ditī′p, sharp (N, E).
dītī′pka, pointed (N).
di*t*i′r, openwork storage basket (E).
djama′, twining; wickerwork (?) (N).
djicī′l, lark (N).
dūka′l, wickerwork (E).
dūta′p, wide mark; large area (E).
dzīyo′dzīyō, zigzag (N, E).
dzīyō′dzīyōka, zigzag (E).
gadi′l, passing along (E).
gai, ? (E).
gaiī′-ce, willow root, a white basket material (E).
ga′iya, ? (E).
gaūcaiya′ūhmak, interlocking (E).
gīca′l, tule (N).
gīwa′l, running along (E).
gūca′l, tule (E).
gūcī′li, lark (E).
gūmū′Lū, spherical basket (E).
ha′i-dūkal, burden basket [openwork of unpeeled rods] (N).
hainē′dū, lattice twining (C).
hai-sī′bo, three-rod foundation (C).
ha′i-tatu, single-rod foundation (C).
ha′kō, conical fish-trap (C).
ha′l-tsawam, border-weave (or braid), literally toward (or at) the mouth braid (C).
ham, space or opening in a pattern, literally end; also near the mouth [used in reference to finishing designs and weaves] (C).
ha′mda, space or opening in a pattern, literally end of it (C).
hamaka′m, finishing design (N).
ha′ske, tattoo [refers to tattoo marks] (N).
hī′baiyax, finishing design (E).
hna, and [or with] (E).
hwa, space or opening in a pattern, literally door (E).
īka′l, burden basket [openwork of peeled rods] (C).
ī′-pīka, feathered basket (N).
ī′tcai, resemble, looks like (C, E).
itī′t, openwork storage basket; wickerwork (?) (C).
kaa′, daylight (?) (C).
kaa′i, crow (C).
kaa′i-kama, crow foot [or track] (N, C).
kaa′mūl, star (C).
kaca′icai, butterfly (N, C, E).

kacī'ltsiya, bluebird (E).
kadabe'mli, going around [plural] (E).
kade'n, follow up (C).
kadē'tan, follow up [plural] (C).
kadī'-kūhūm, sedge, a white basket material (N).
kaga', arrowhead (E).
kaga'-daLaū, arrowhead-half (E).
kaga'-mīset, arrowhead-sharp (E).
ka'ia, shell beads (N).
kaia'n, mallard (N, C, E).
kaitsa'kai, stretcher [see xaitsa'k] (E).
kaiyō'ī, oriole (C).
kaiyō'yū, oriole (N).
kaiyūla'l, upward (E).
kakaiûtcō'm, ? (C).
ka'kōi, cylindrical fish-trap (N).
kala'cūna, elliptical or boat-shaped basket (C).
kala'ia, redbud, a red basket material (C).
kala'ia-katō, redbud, a white basket material (C).
kala'l, willow stem (N, C).
kala'l-sībo, three-rod foundation (C).
kala'l-yem, willow root, a white basket material (N).
kala't, approximately parallel lines (C).
kala'tkaū, drawn-out (N, C).
kale', white (N).
kale'-ce, digger-pine root, a white basket material (N, C, E).
kale'l, nothing (E).
kalītcō'tco, bluebird (N).
kalū', blank, space (C).
kalū'tūduk, striped-watersnake (E).
kalū'tū*r*uk, striped-watersnake (E).
kama, mark; foot [or track] (N, C, E).
ka'm*t*iltalī, killdeer (C).
kam*t*i'ltalī-ūī-kūwī, killdeer-eyebrow (C).
kana', close (N).
kana'dihwa, turtle (E).
kana'dīhwa-kama, turtle-foot (E).
kana'dīhwa-kīdī, turtle-back (E).
kana'dīhwa-kōī, turtle-neck (E).
kapō'kpōkō, spotted (C).
ka*r*a'tc, redheaded woodpecker (E).
karū's, cross [derived from the Spanish cruz] (C).
kase'tka, sharp-points (N).
kasūl'*t*ak, long (C).
kata', empty, blank, nothing (N).
kata'iitcai, separated [plural] (?); set-far-apart [plural] (?) (C).
kata'k, redheaded woodpecker (C).
kata'talak, bat (N).
kata'talak-ca, bat's wing (N).

kata'tc, redheaded woodpecker (N).
katca', arrowhead; also applied to the obsidian knife (C).
katca'-dalaū, arrowhead-half (C).
katca'k, arrowhead (N).
katca'-mset, arrowhead-sharp (C).
katca'-mtil, arrowhead-slender (C).
katca'-mtīp, arrowhead-sharp-pointed (C).
katcō'm, together (C).
ka*t*e'ltaimaū, interlocking (N).
ka'*t*īyōtīyō, zigzag (N, C, E).
ka*t*ī'yō'*t*i'yō, zigzag (C, E.)
ka'tōla, cup (of acorn).
katsa'-kūhūm, sedge, a white basket material (E).
katse', black (N).
katsī'ya, yellowhammer (C).
ka'tsīyōtsīyō, zigzag (N).
katsū'ttciū, swelled (C).
katū'k, elbow? (C).
kawa'ca, pine-tree (N).
kawīn'a, turtle (N, C).
kawī'na-kama, turtle-foot (N, C).
kawī'na-kū, turtle-neck (N).
kawī'na-tcīdik, turtle-back (N).
kawī'na-utca, turtle-neck (C).
ke, from (C).
kē'ya, plume or crest. Used in reference to the plume of the quail (N).
kī, crab (N).
kibū'k, coiling (E).
kī'cki, twining (E).
kīdī, back, spinal column (E).
kī'-*t*ana, crab claw [or hand] (N).
kohō'ī, mountain quail (N, C).
kō'ī, neck (E).
kol, outward. Used only in connection with such triangular elements as those shown in figs. 18 and 19, and said to signify that in making such a figure the work progresses constantly outward, *i.e.*, away from the middle of the pattern, by virtue of the fact that each row of twining is a little longer than the one next below. Cf. teal (C).
kō'lai, long [plural] (C).
kōldaiya'ūhmak, meet (E).
kō'l-katca, outward-arrowhead (C).
kō''nawa, on-both-sides (E).
kōwal, on-the-outside (C).
kōwaldakade'n, following on the outside (C).
kōwaldakadē'tan, following on the outside [plural] (C).
kū, neck (N).
kū'dja, small (E).
kūhūm', sedge, a white basket material (N, C, E).

kū*t*, small (E).
kū'ta, small (E).
Lal, goose (E).
la'la, middle, in-the-middle, among (C).
La'l-a-pa, goose excrement (E).
lē'Lan, center [geometric]; in-the-center (C).
lī'bītsits, bracken, a black basket material (E).
lik, band (E).
maa', acorn (N).
maa-ka'tōla, acorn-head [or cup] (N).
ma'-ce, willow root, a white basket material (C).
mala'da, near (C).
maō', back (N).
mao'dō-kit, bracken, a black basket material (C).
masa'kalak, striped-watersnake (N).
masa'n, whiteman (N, C, E).
ma'-yem, willow root, a white basket material (N).
meō', back (C).
mīdje', mortar basket (N, E).
mīLa'ū, split-open (E).
mille', redbud, a red basket material (N).
mille-to'i, redbud, a white basket material (N).
mina', over, upon (N).
mina'-da*t*ēkama, crossing, literally top-lie-on (N).
mina'da*t*ēkama, crossing. This term appears to differ from mina'da*t*ē-kama in that it carries a plural idea, that of crossing endlessly (N).
mīsa'k, rib (E).
mīsa'kala, striped-watersnake (N).
misa'kalak, striped-watersnake (N).
mīse't, sharp (N, E).
mka'liteai, scattered [plural] (N).
msak, rib (C).
msa'kale, striped-watersnake (C).
mest, sharp (C).
mtca'kōlai, ? (C).
mtce, mortar basket (C).
mtil, slender (C).
mtīp, sharp-pointed (C).
m*t*o'*t*, border finish (C).
mūl, in a circle, circular (N).
na, and [or with] (E).
nasū', plate-form basket (C).
nat, ? (N).
naū, above (C).
nē'*t*ak, throw. Probably denotes long or extended (N).
o, teeth. Applied not only to teeth but also to anything with a sharp edge or point (N, C).
ōn'ma, basket (C).
ō'pitai, sharp-pointed (plural).

pa, excrement (E).
pase', openwork storage basket (N).
pase'r, tied-together, tied together in a bunch (E).
pce, deer (C).
pce'-meō, deer-back (C).
pcē'-pīya, deer-elbow (C).
pdū, acorn (C).
pdū'-cna, acorn-head [or cup] (C).
pīka', basket (N).
pīka'-tcadōl, spherical basket (N).
pīya', elbow (C).
po, magnesite beads (N, C).
pol, magnesite beads (E).
ptcī', burden basket [closely woven] (C).
ptcō'yai, short [plural] (C).
ptsat, starting knots used intwined basketry (C).
sal, openwork basket, culinary (C).
sa'l-stin, openwork basket [sifter type] (C).
sī'bō, three (C).
sīka, basketry cradle (N).
sīlī', starting knots used in twined basketry (N).
sīli'x, starting knots used in twined basketry (E).
sīsī'sīsī, small figures (N).
sī'wa, mountain robin (N, C, E).
sle'ma, string (C).
stē'ik, starfish (C).
sū'kan, plate-form sifting basket (C).
tacīma, redbud, a white basket material (E).
*t*a'kan, cylindrical basket (C).
ta*k*a'nma, far apart (?) (C).
*t*alē'ya, shell beads (C).
*t*ana', hand, claw (N).
ta'-pīka, feathered basket (N).
ta-sī'tōi, feathered basket (E).
ta'-stōl, feathered basket (C).
ta-tsaka't, bluebird (C).
ta'tū, one [or single] (C).
tcadī'mūl, going around and meeting [singular] (N).
tcacī'*t*emūl, going around and meeting [plural] (N).
tcada'mūl, circle, circular (N).
tca'dim, ? (E).
tcadō'lai, globular [plural] (N).
tcadō'tcadō, circular (C).
tcal, inward, toward. Used only in connection with triangular elements such as those shown in figs. 17 and 20, and signifying that in making such a figure the work constantly progresses inward toward the middle of the pattern, by virtue of the fact that each row of twining fibers is a little shorter than the one next below. Cf. kol. (C).

tcal-katca, inward-arrowhead (C).
tcama'ū, twining; burden basket [openwork of unpeeled rods] (C).
tcī, design, mark, figure (C).
tcīdi'k, back (N).
tcīdī'yemūl, ? (N).
tcīga', lattice-twining (E).
tcil, stuck on, hanging or stuck on the side or bottom (C).
tcī'yaū, ? (C).
tcūwa'k, stripe (C).
tcūwa'n, stripe (C).
tc'm-gata, abalone shell (N).
tē'ū, plate-form basket [small] (C, E).
t!i', lattice-twining (N).
ti'a, big (E).
tirī'-bugu, basket of truncated cone form (E).
tīya'l, yellowhammer (E).
tō, stand in (E).
tōl, on (C).
too'-pīka, cylindrical basket (N).
tsai, jay (N, C, E); single-rod foundation (N, C, E).
tsada'r, half-cylinder fish-trap (E).
tsada't, half-cylinder fish-trap (C).
tsaga'tsagaū, oriole (E).
tsakō'tsakōka, zigzag (N).
tsatō'tō, robin (C).
tsawa'l, sunfish (C, E).
tsawa'l-mīsak, sunfish-rib (E).
tsawa'l-msak, sunfish-rib (C).
tsawa'm, border finish, literally braid (N, C).
tsawa'mk, border finish, literally braid (E).
tsīkē'ga, zigzag (?) (N).
tsilī', redwinged blackbird (C).
tsītōk'tok, robin (N).
tsītō'tō, robin (E).
tsīwi'c, balrush, a black basket material (N, C, E).
tsīyō'tsīyō, zigzag (N,C, E).
tsīyō'tsiyōka, zigzag (N, C).
tso'i, small openwork storage basket; burden basket [openwork of peeled or unpeeled rods] (N, E).
tsūba'ha, willow stem (E).
tsūhū'n, ? (N).
tsū'Lī, redwinged blackbird (E).
tū, side (N).
tū'ga, lattice-twining (E).
tūl, side (C).
tū'ntūn, ants (C, E).
ū'ī, eye (C, E).
u'ī-balaū, eye-half (C).

ū'ī-balaū-ai, eye-half [plural] (C).
ū'ī-kūwī, eyebrow (C).
ūna'Liū, crossing (C).
ūtca', neck (C).
ūyahō', star (E).
ūyīl'-to, basket of truncated cone form (N).
ū'yū, above, upper, up (C).
ū'yūl, upward (N).
wada'ha, the Spanish game of cards (C).
wīl, abalone shell (C).
wīna', top, over (E).
wīna'līhempke, crossing (E).
xaca'icai, butterfly (E).
xaga', arrowhead (E).
xaga'-dīset, arrowhead projecting (E).
xaga'-mīLaū, arrowhead-split-open (E).
xa'i-kalī, single-rod foundation (E).
xa'i-katōli, basketry cradle (E).
xaitsa'k, a stretcher made by twining green withes together and used for carrying an injured person, as for instance one injured while hunting at a distance from the village (E).
xaitsa'kai, stretcher (E).
xai-xa'lī, plain twining (E).
xai-xō'mka, three-rod foundation (E).
xala'cūna, elliptical or boat-shaped basket (E).
xale'l, nothing (E).
xa'lī, one [or single] (E).
xaLū', blank, space (E).
xam, among (E).
xama', mark, foot, track (E).
xana'dihwa, turtle (E).
xa'tīyōtīyō, zigzag (E).
xa*t*ī'yō'*t*ī'yō, zigzag (E).
xa'xōi, cylindrical fish-trap (E).
xe, plume or crest, used in reference to the plume of the quail (E).
xōl, both (N).
xō'ldabē'hmak, meet (E).
xō'l-*t*ū, on-both-sides (N).
xō''nawa, on both sides (E).
xōtca'gan, running along in pairs (E).
xū*t*, small (E).
yanī'ya, calico (a term derived from the Spanish).
yaō, teeth (E).
yee, breast (N).
yīī'-cat, feathered basket (E).
yō, lower, down (C).
yō'wil, downward (N).

Fold-out Placeholder

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EXPLANATION OF PLATE 15.

Figure 1.—Starting knot with two pairs of warp sticks crossed and the weft elements passing diagonally to the angles formed.

Figure 2.—Starting knot with weft elements forming a cross with arms parallel to the warp sticks.

Figure 3.—Starting knot with no other fastening than the ordinary twining.

Figure 4.—Starting knot having two pairs on the outside and one pair inside.

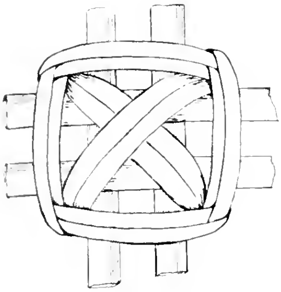
Figure 5.—Starting knot with four warp sticks in each direction.

Figure 6.—Starting knot with three warp sticks in each direction.

Figure 7.—Complicated lattice twining employed upon baby baskets.

Figure 8.—Twining upon multiple warp used in border finishing.

Figure 9.—Starting knot in which warp sticks are first joined by twining and then crossed.



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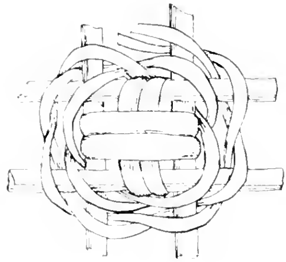

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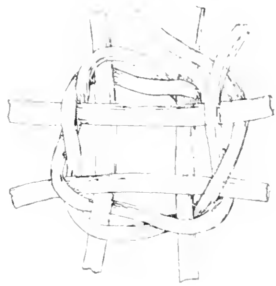

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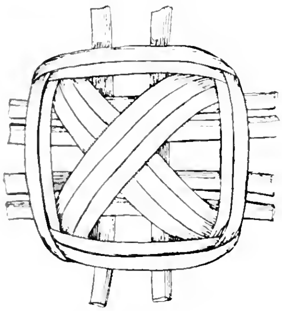

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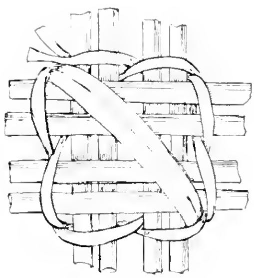

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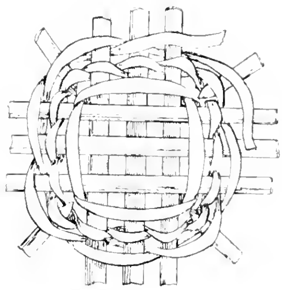

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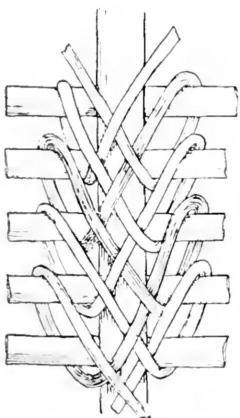

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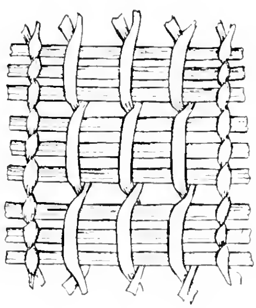

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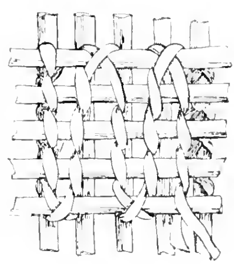

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EXPLANATION OF PLATE 16.

Figure 1.—Plain twined cooking basket. Horizontal arrangement of triangles with rhomboids. No. IVB 7302.*

Figure 2.—Diagonal twined, spheroidal basket. Diagonal arrangement of large triangles bordered by small ones with rhomboids in parallel rows between them. No. IVB 7269.

Figure 3.—Diagonal twined cooking basket approaching spheroidal form. Banded arrangement of diamond shaped designs. No. IVB 7280.

Figure 4.—Plain twined cooking basket. Small rhomboids crossed by a white line placed between horizontal rows of large triangles. No. IVB 7283.

Figure 5.—Diagonal twined cooking basket. Diagonally arranged triangles with rhomboids between. No. IVB 7286.

Figure 6.—Diagonal twined basket decorated with valley quail plumes and white shell beads. Triangles so arranged as to appear either diagonal and parallel, or diagonal and crossing. No. 1-366. $\times \frac{1}{4}$.

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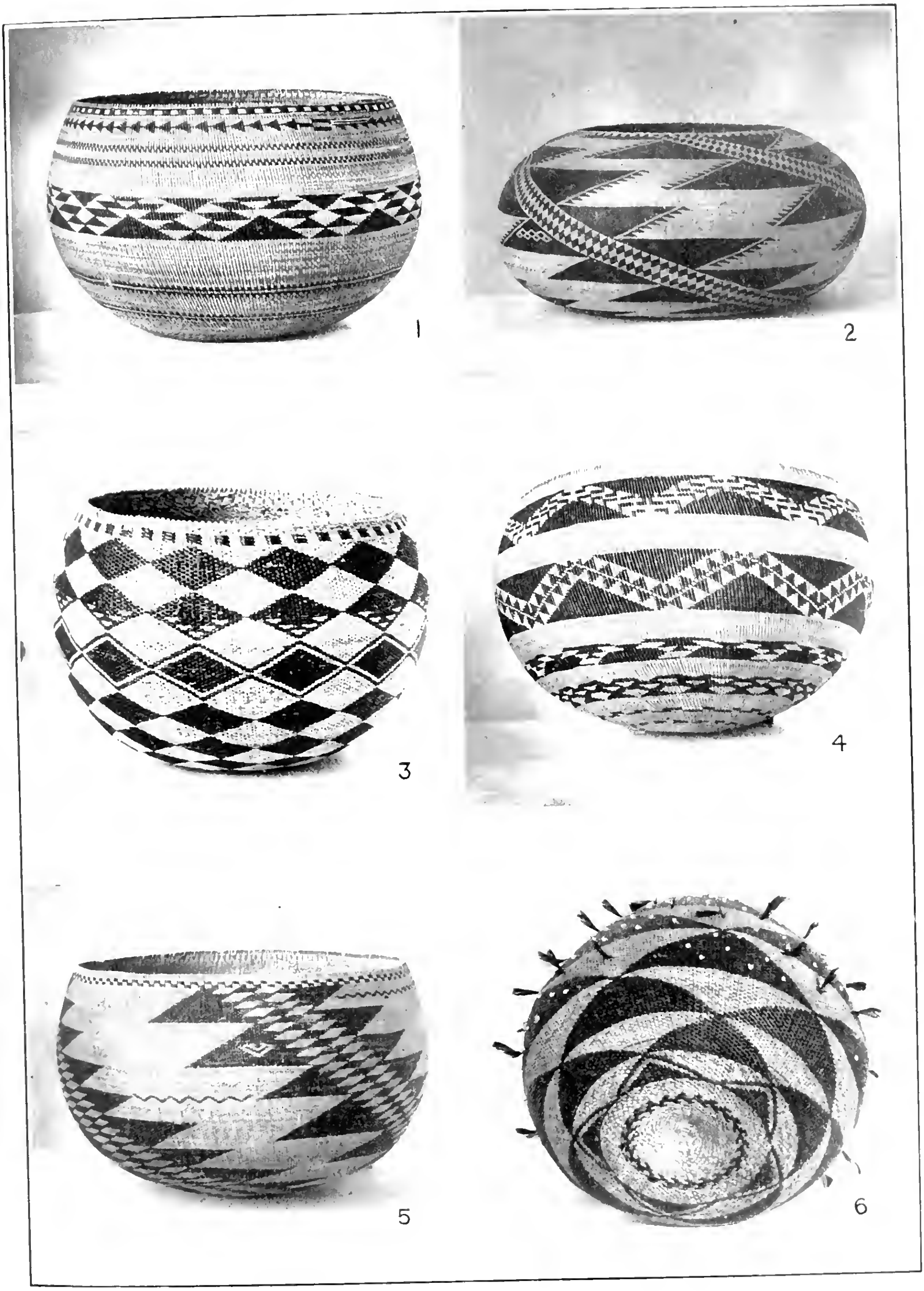
* All numbers other than those of the series IV B refer to baskets in the Museum of the Department of Anthropology of the University of California; those of the series IV B refer to baskets in a collection made by the author and now the property of the Königliches Museum für Völkerkunde in Berlin.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EXPLANATION OF PLATE 17.

Figure 1.—Plain twined storage basket. Banded pattern composed of large triangles with rhomboids between. No. 1-3013. × 1/12.

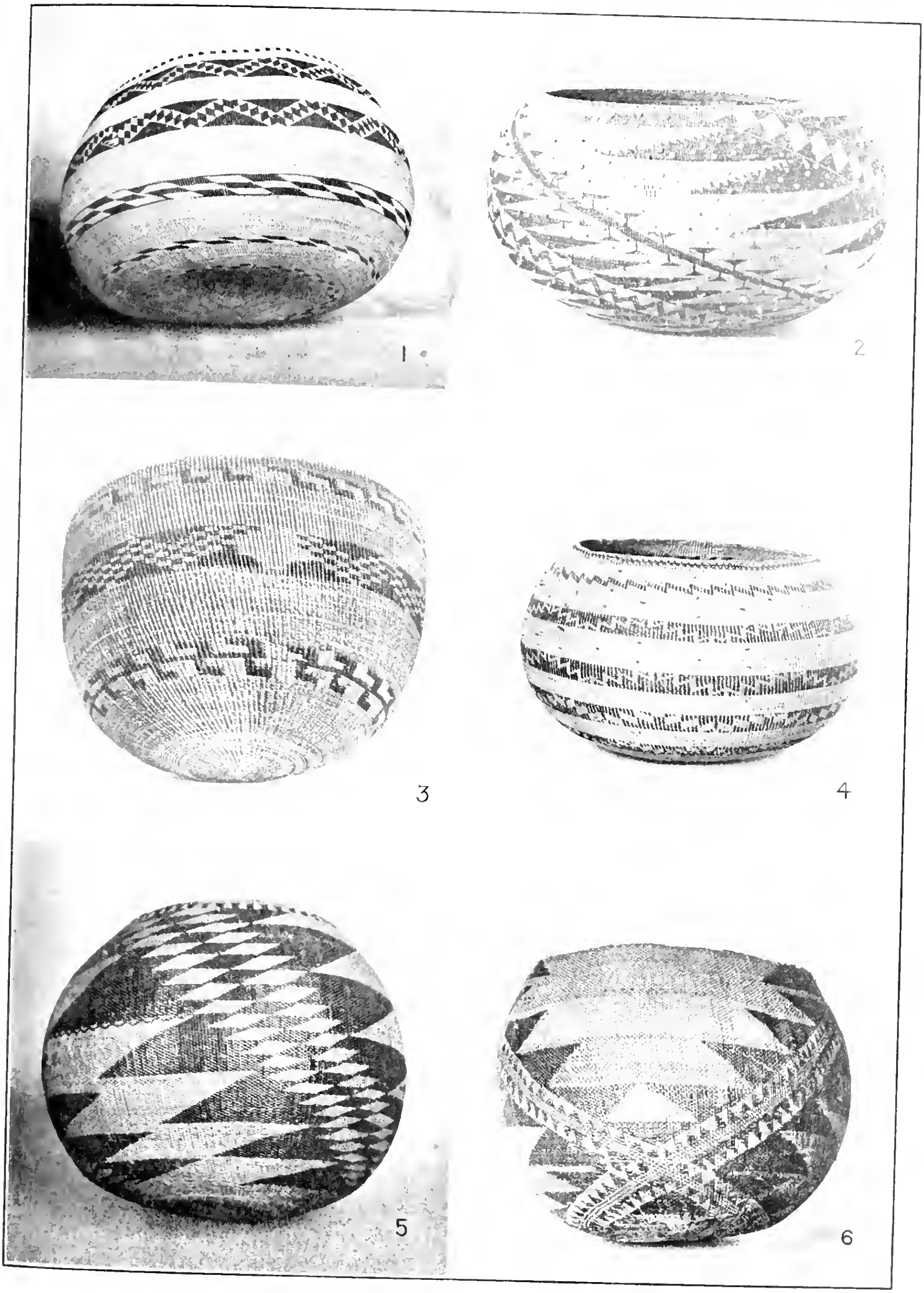
Figure 2.—Lattice-twined storage basket. Horizontally arranged triangles bordered by small ones. White shell beads are attached to the basket by means of the twining material itself. No. IVB 7270.

Figure 3.—Plain twined cooking basket. Banded arrangement of quail plume designs. The *dau* appears in the middle band. No. 1-367. × 1/7.

Figure 4.—Lattice-twined storage basket of spherical form. The upper bands of triangles have white zigzags and the lower ones rhomboids. No. 1-3069. × 1/6.

Figure 5.—Diagonal twined basket. Diagonally arranged triangles, rows of rhomboids between. No. 1-3030. × 1/5.

Figure 6.—Diagonal twined cylindrical cooking basket. A crossing arrangement of triangles within triangles which enclose small rhomboids. No. 1-3022. × 1/8.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EXPLANATION OF PLATE 18.

Figure 1.—Coiled, spheroidal basket. Diagonal arrangement of triangles within triangles. No. IVB 7235.

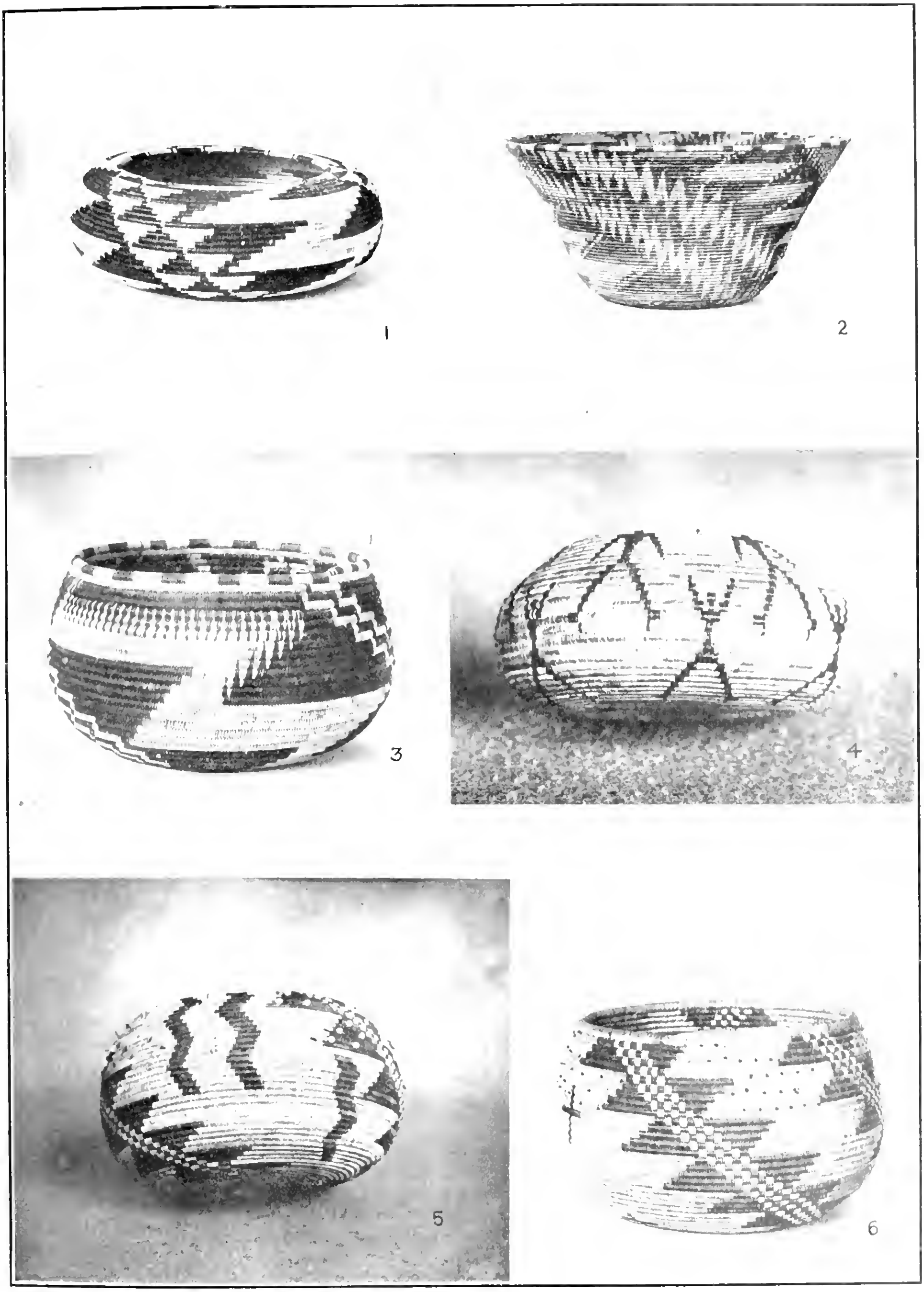
Figure 2.—Coiled, flaring funnel-shaped basket. Triangles with projecting points diagonally arranged with zigzags between. No. 1-3018. × ⅛.

Figure 3.—Coiled, globose basket. Diagonally placed large triangles bordered with very acute small ones having a row of rectangles between them. No. IVB 7255.

Figure 4.—Coiled, globose basket showing the human figure introduced under European influence. No. 1-434. × ½.

Figure 5.—Coiled, globose basket. Vertically arranged zigzags and diagonally arranged triangles with rectangles between. No. 1-337. × ⅕.

Figure 6.—Coiled, globose basket. Rows of small rectangles enclosed by large triangles diagonally arranged. The cross shown has been copied from a church. No. 1-3072. × ⅕.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EXPLANATION OF PLATE 19.

Figure 1.—Coiled on single-rod foundation, truncated-cone-shaped basket. Diagonally arranged double row of triangles with white rectangles between. An initial design is shown on the bottom. No. 1-3058. $\times \frac{1}{4}$.

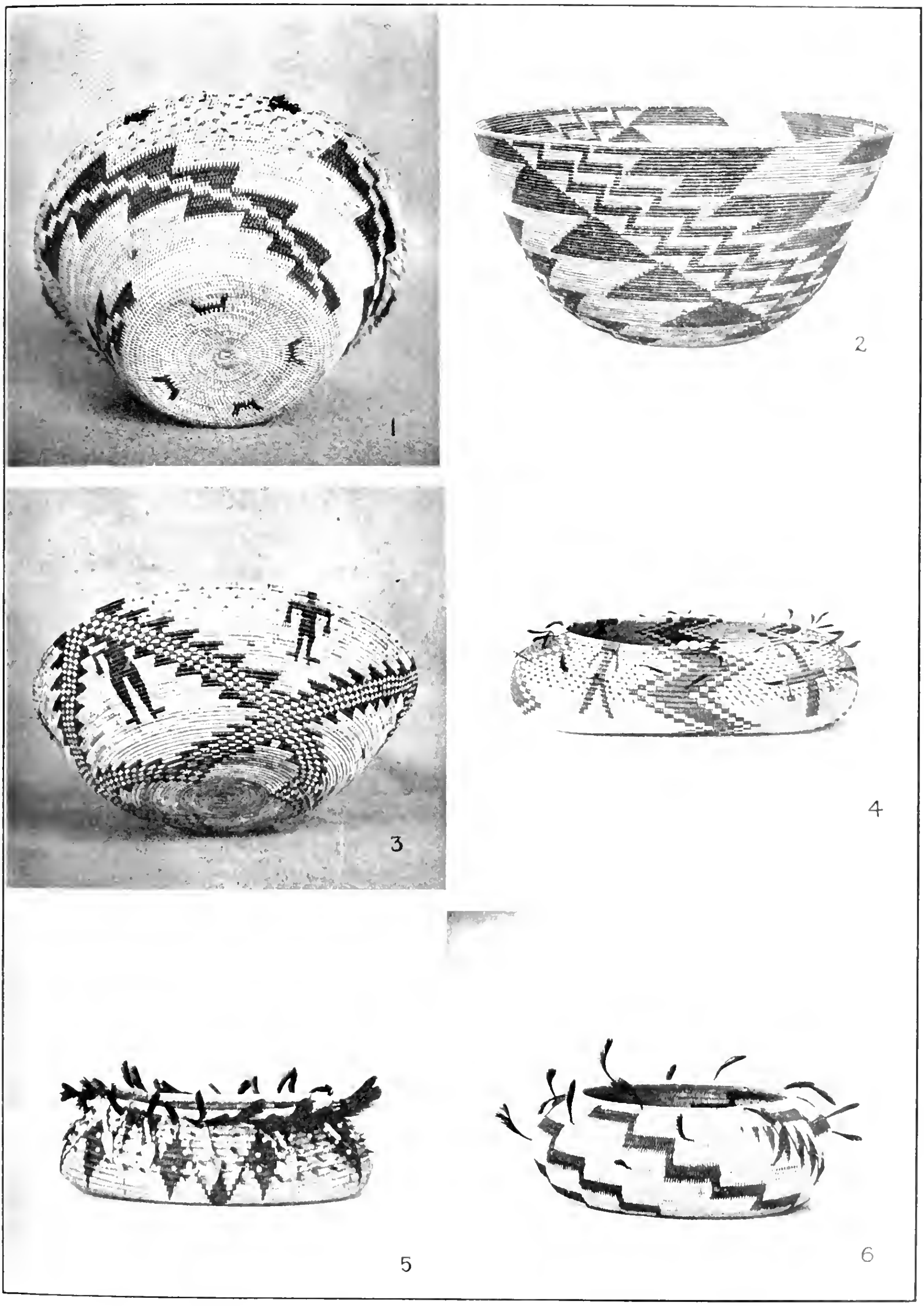
Figure 2.—Coiled, truncated-cone-shaped basket. Diagonal arrangement of triangles with a double row of zigzags between. No. 1-3012. $\times \frac{1}{10}$.

Figure 3.—Coiled, hemispherical basket. Crossing diagonal rows of triangles with rows of small rectangles. The human figure, a motive of late origin, is introduced. No. 1-3074. $\times \frac{1}{10}$.

Figure 4.—Coiled, elliptical basket decorated with red feathers of the woodpecker and groups of shell beads. Vertically placed pattern. No. IVB 7218.

Figure 5.—Coiled, elliptical basket with feathers and abalone shell pendants attached. Pattern vertically arranged. No. IVB 7217.

Figure 6.—Coiled, elliptical basket. A zigzag pattern diagonally placed. No. IVB 7224.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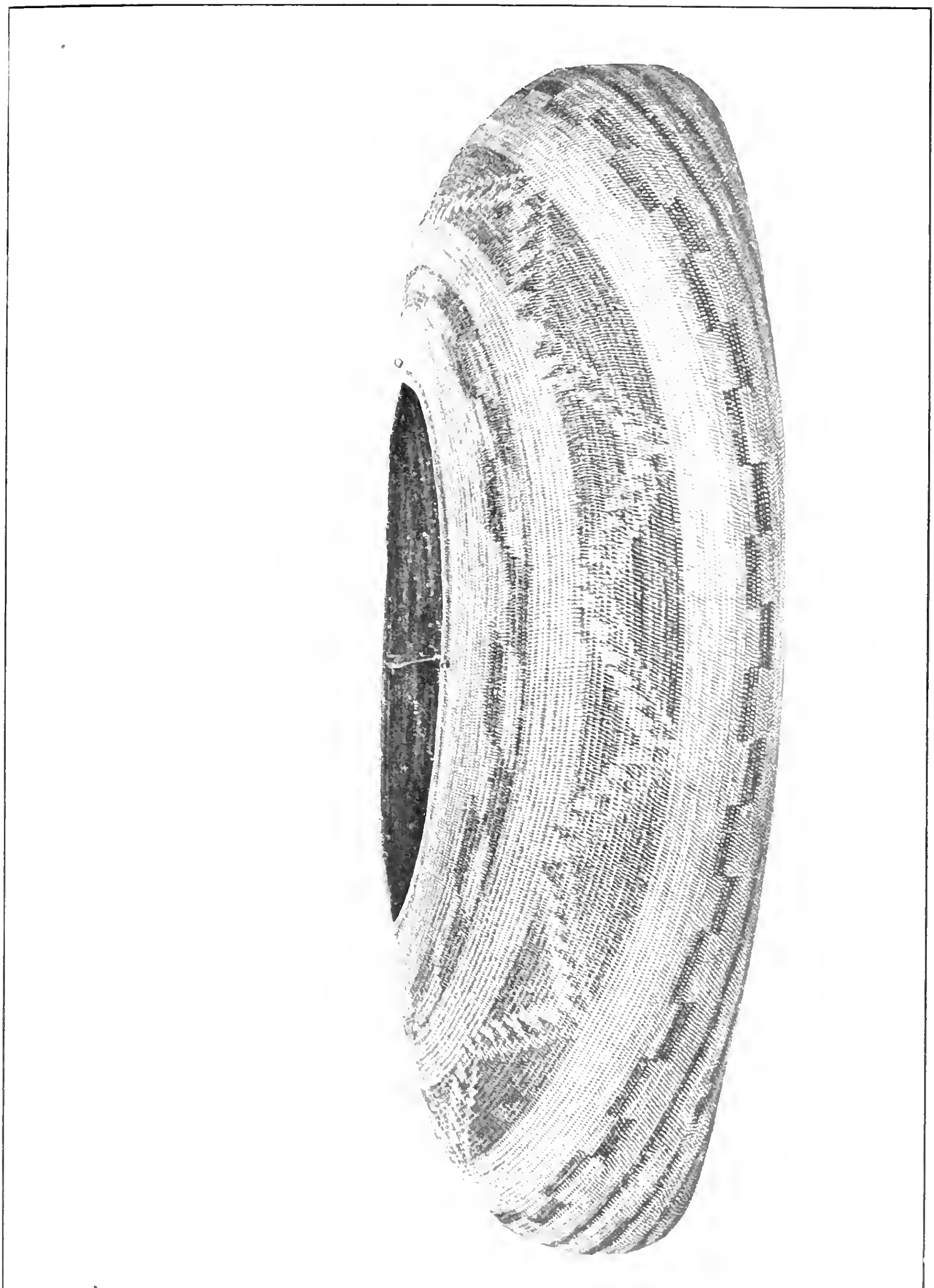
EXPLANATION OF PLATE 20.

A ceremonial basket used by shamans for the storage of sacred objects. Coiled on single-rod foundation, elliptical in form with horizontally arranged patterns. No. 1-3009. × 1/5.



EXPLANATION OF PLATE 21.

Figure 1.—Coiled basket completely covered with feathers which form designs. Triangular abalone pendants are attached. No. IVB 7212.

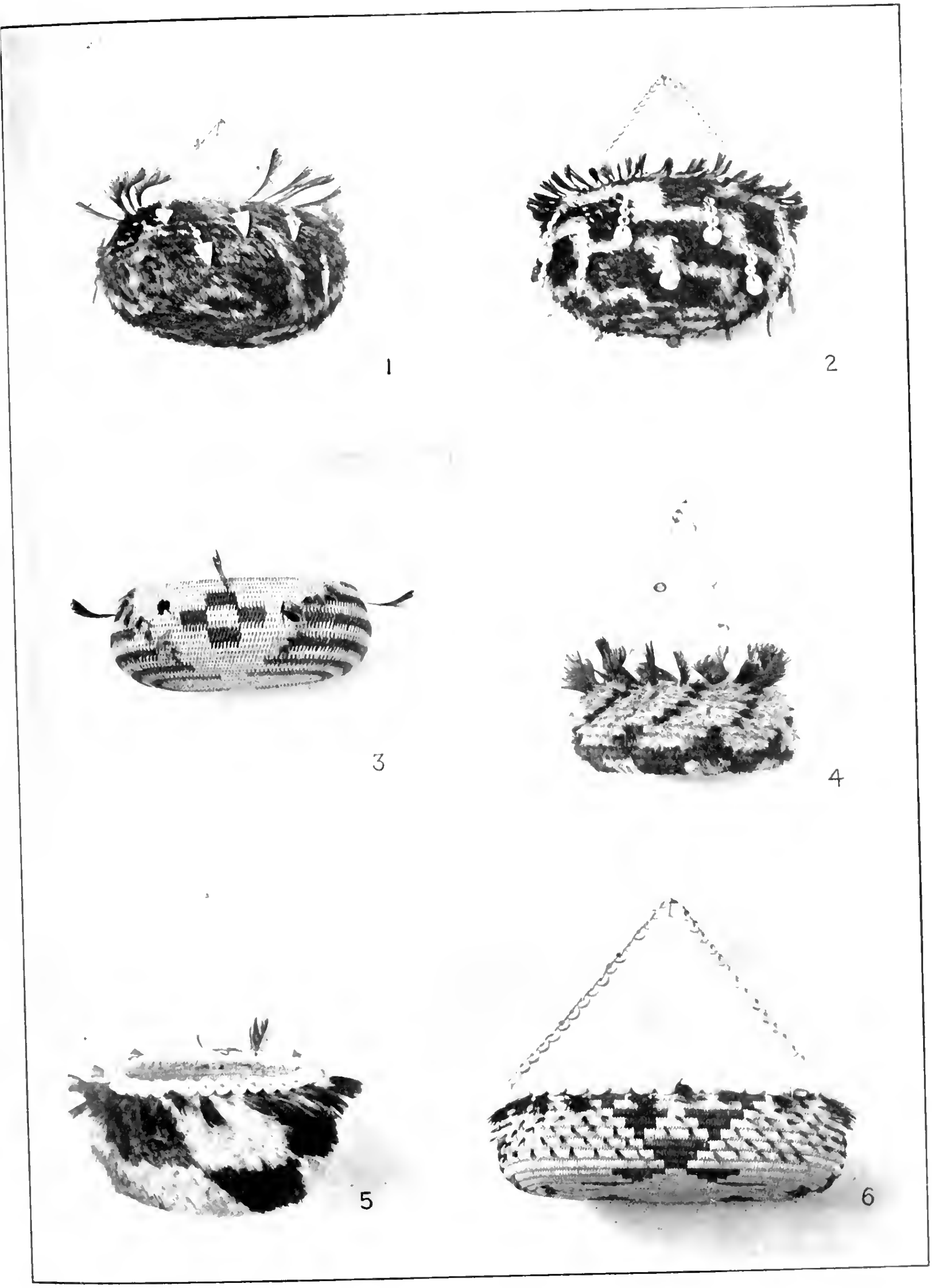
Figure 2.—Coiled basket with patterns worked in the feathers which entirely cover it. A bail and pendants of shell are added. The opening is provided with a row of quail plumes. No. IVB 7207.

Figure 3.—Coiled basket of single-rod foundation, elliptical in form. The horizontal bands are interrupted and rectangles arranged in a white triangle. No. IVB 7222.

Figure 4.—Coiled basket completely covered with variously colored feathers presenting the pattern. No. IVB 7209.

Figure 5.—Feather-covered, coiled basket. The opening has a continuous row of shell beads. No. IVB 7208.

Figure 6.—Coiled, elliptical basket decorated with feathers and beads. Crossing triangles extend over the bottom as well as the sides. No. IVB 1719.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EXPLANATION OF PLATE 22.

Closely twined conical burden baskets.

Figure 1.—Diagonal twined with a hoop-bound opening. Diagonally arranged triangles with zigzags between. Small, bordering triangles appear. No. 1-3016. $\times \frac{1}{10}$.

Figure 2.—Diagonal twined and hoop-bound. Triangles diagonally arranged with zigzags.

Figure 3.—Diagonal twined. Pattern of diagonally arranged triangles with a row of white rhomboids. No. IVB 7272.

Figure 4.—Diagonal twined. A border triangle so repeated as to appear in horizontal bands, diagonal parallel rows, or diagonal crossing rows. No. IVB 7271.

Figure 5.—Diagonal twined. Triangles, and rhomboids diagonally arranged. No. IVB 7274.

Figure 6.—Plain twined. Rectangles and zigzags arranged in horizontal bands. No. IVB 7273.

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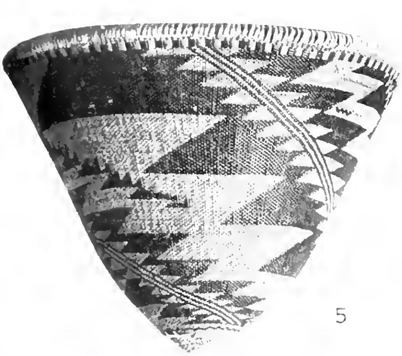

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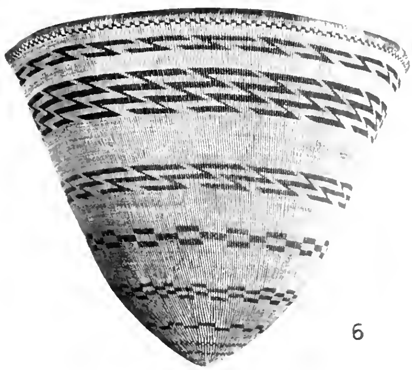

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EXPLANATION OF PLATE 23.

Figure 1.—Lattice-twined, plate-form, winnowing basket. Banded rows of triangles and rhomboids intentionally interrupted by a different design. No. IVB 7298.

Figure 2.—Lattice-twined, plate-form, winnowing basket. Horizontally arranged patterns. No. IVB 7295.

Figure 3.—Plain and lattice-twined mortar. The horizontal band of triangles with rhomboids between them show an interruption. No. IVB 7311.

Figure 4.—Plain and lattice-twined mortar in position. A hoop bound to the opening makes it rigid. Nos. 1-19, 1-2762, 1-3033. $\times \frac{1}{11}$.

Figure 5.—Plain and lattice-twined sifter provided with a string loop. Horizontal arrangement of rhomboids with an interruption. No. IVB 7305.

Figure 6.—Plain twined sifting basket with a peg for holding it. No. 1-10607. $\times \frac{1}{7}$.


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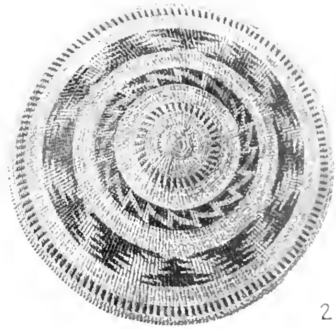
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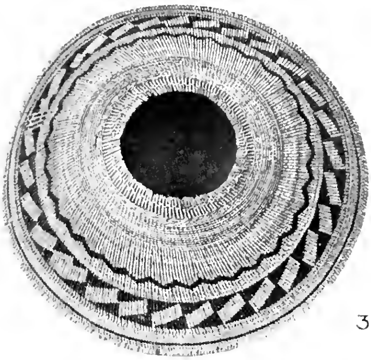
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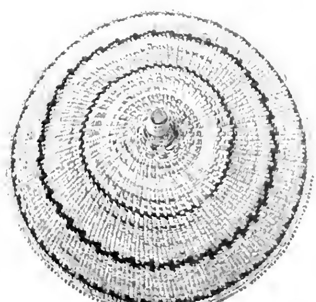
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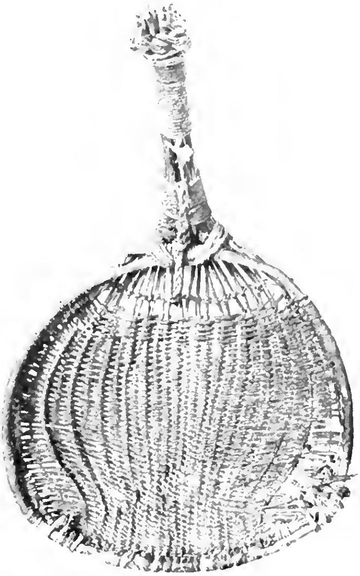
EXPLANATION OF PLATE 24.

Figure 1.—Wickerwork seed-beater. No. 1-4102. × 1/8.

Figure 2.—Baby basket, provided with a carrying strap, thongs and cord for lacing the child in, and a hoop to hold the covering away from the child's head. No. 1-2362. × 1/11.

Figure 3.—Plain twined shallow basket. No. 1-405.

Figure 4.—Plain twined seed-beater. No. 1-714.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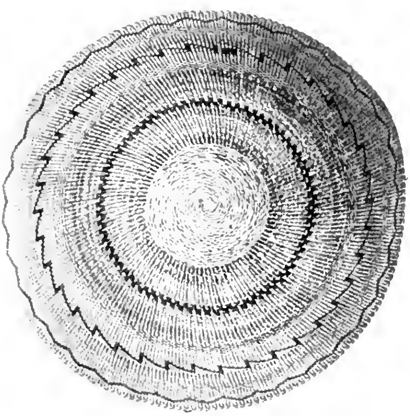
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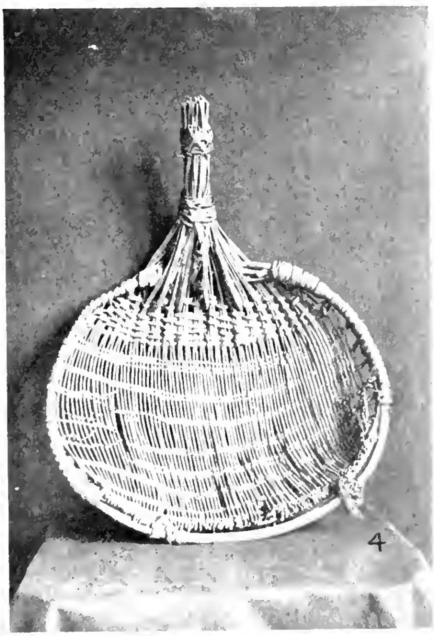
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EXPLANATION OF PLATE 25.

Figure 1.—Plain twined openwork basket. No. 1-450. × 1/8.

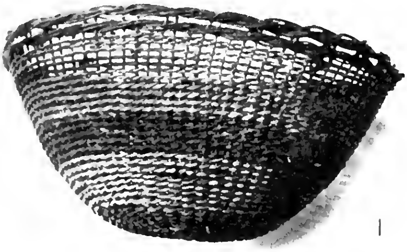
Figure 2.—Plain twined openwork storage basket decorated with beads. No. 1-4125. × 1/8.

Figure 3.—Lattice-twined, hemispherical basket. No. 1-4101. × 1/8.

Figure 4.—Plain twined on a multiple foundation. No. 1-4109. × 1/8.

Figure 5.—Plain twined openwork basket. No. 1-4110. × 1/8.

Figure 6.—Three-strand twined hemispherical openwork basket. No. 1-4470. × 1/8.



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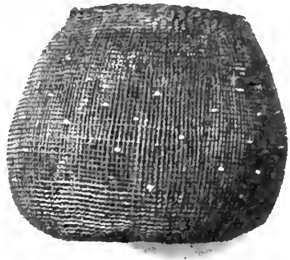

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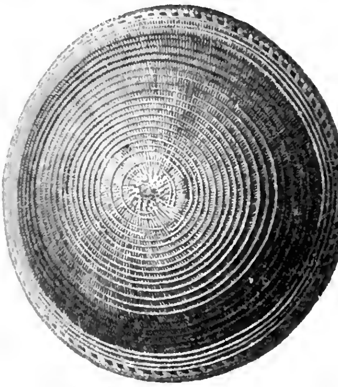

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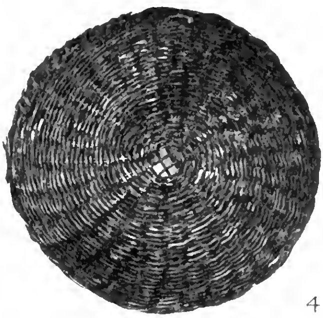

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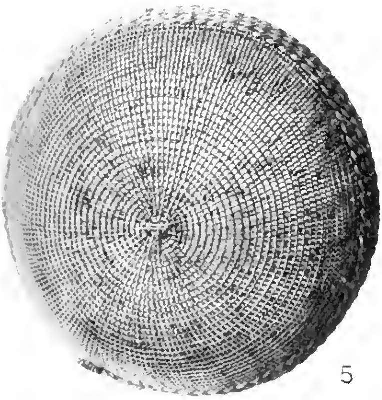

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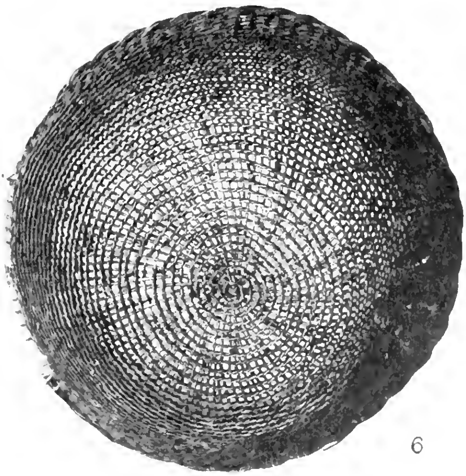

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EXPLANATION OF PLATE 26.

Figure 1.—Plain twined openwork burden basket. No. 1-2593. $\times \frac{1}{9}$.

Figure 2.—Plain twined openwork burden basket. No. 1-3025. $\times \frac{1}{9}$.

Figure 3.—Plain twined openwork storage basket. No. 1-3029. $\times \frac{1}{9}$.

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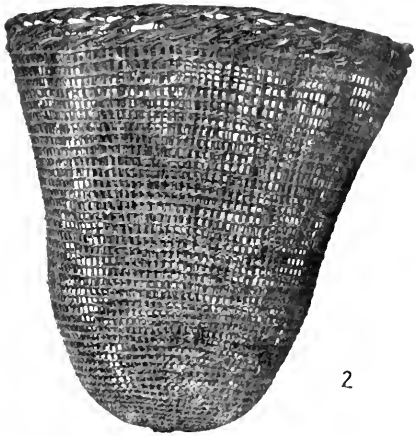

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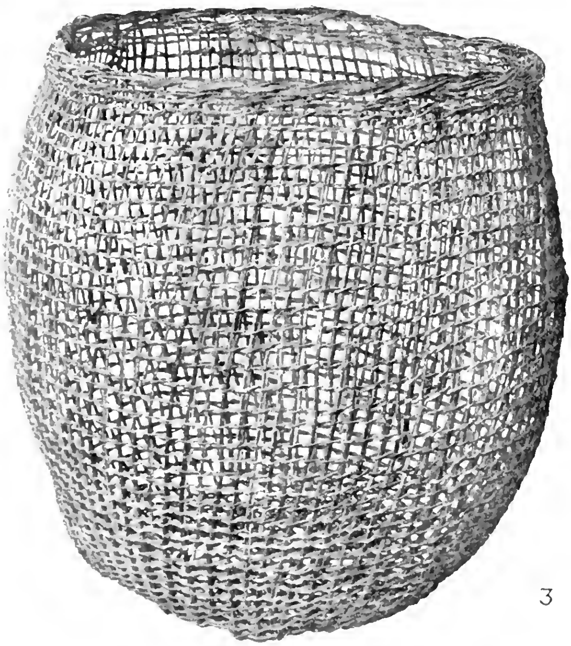

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EXPLANATION OF PLATE 27.

Figure 1.—Openwork basket for catching woodpeckers. No. 1-2607. × 1/15.

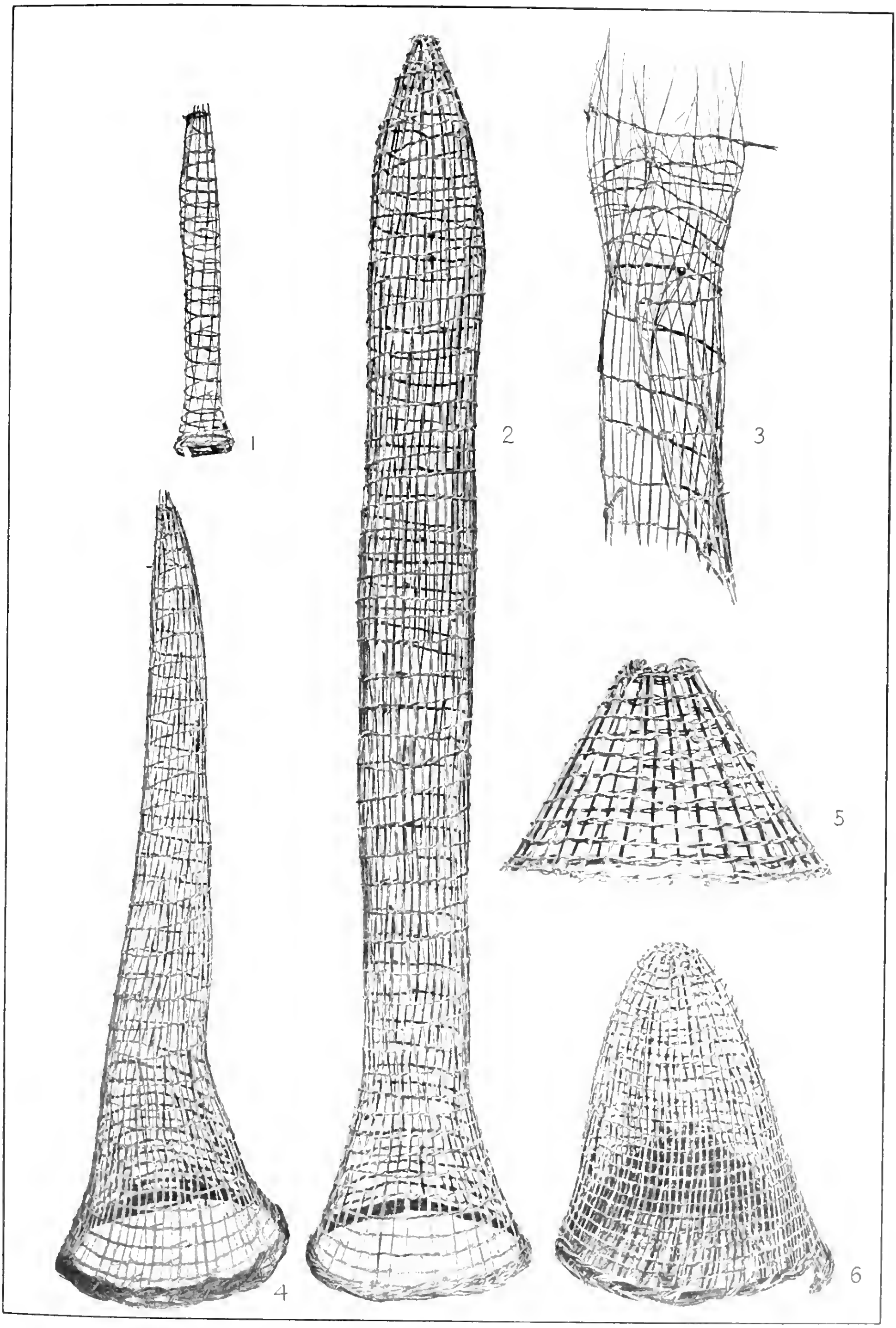
Figure 2.—Long openwork basket set in a fish-wier as a trap. No. 1-2581. × 1/15.

Figure 3.—A fish-trap used in shallow water. No. 1-2597. × 1/15.

Figure 4.—A fish-trap used in connection with a wier. No. 1-2605. × 1/15.

Figure 5.—A trap used for catching fish in muddy water. The hand is inserted in the opening above to remove the fish. No. 1-2603. × 1/15.

Figure 6.—A trap provided with a conical mouth to prevent the escape of the fish. No. 1-2587. × 1/15.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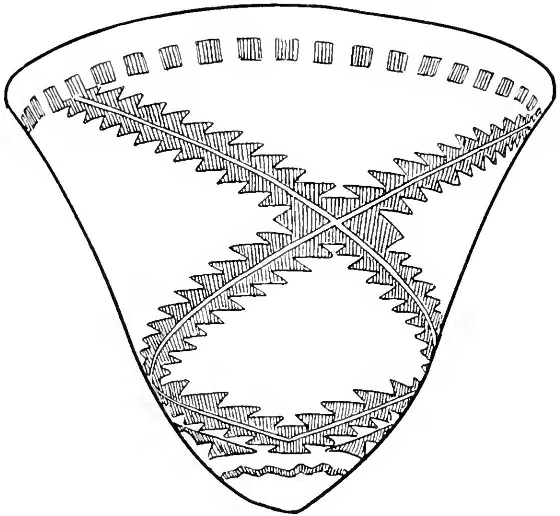
EXPLANATION OF PLATE 28.

Figure 1.—A crossing pattern composed of double rows of triangles found on a closely twined burden basket. No. IVB 7279.

Figure 2.—A vertical arrangement of arrowhead designs. No. IVB 7226.

Figure 3.—Plain twined openwork quail trap. Nos. 1-2588, 1-2589, 1-2592, 1-2599.



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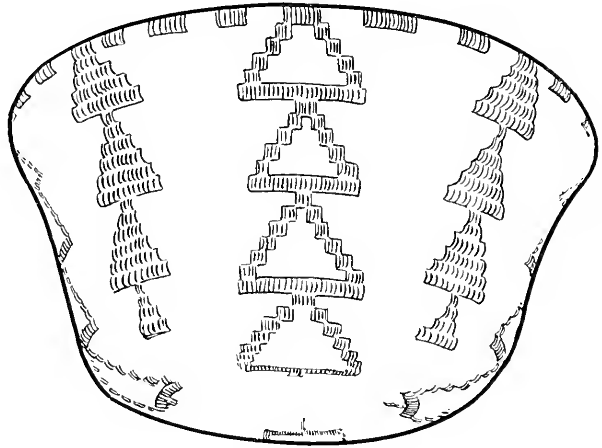

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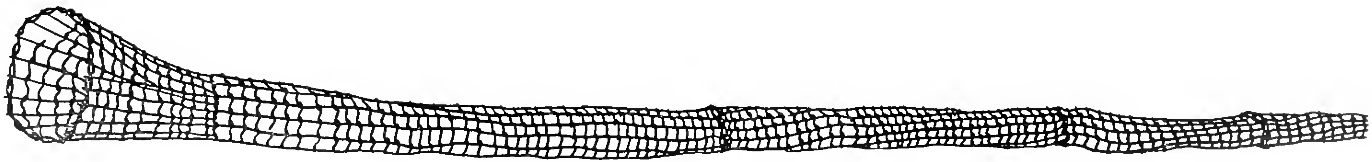

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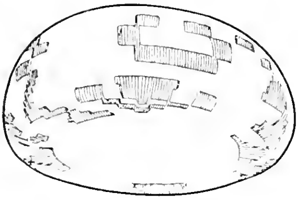
EXPLANATION OF PLATE 29.

Figures 1 to 4.—Four views of the same basket showing an individual or independent disposition of the designs. No. IVB 7241.

Figure 5.—Vertical arrangement of patterns. No. IVB 7259.

Figure 6.—An isolated design. No. IVB 7256.



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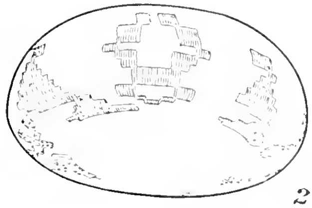

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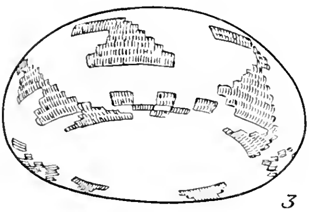

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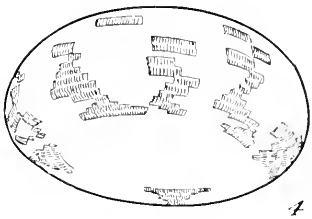

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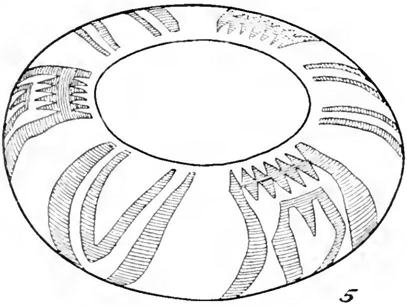

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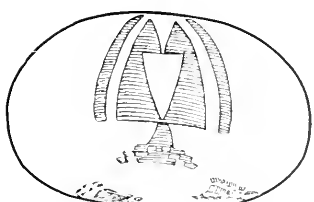

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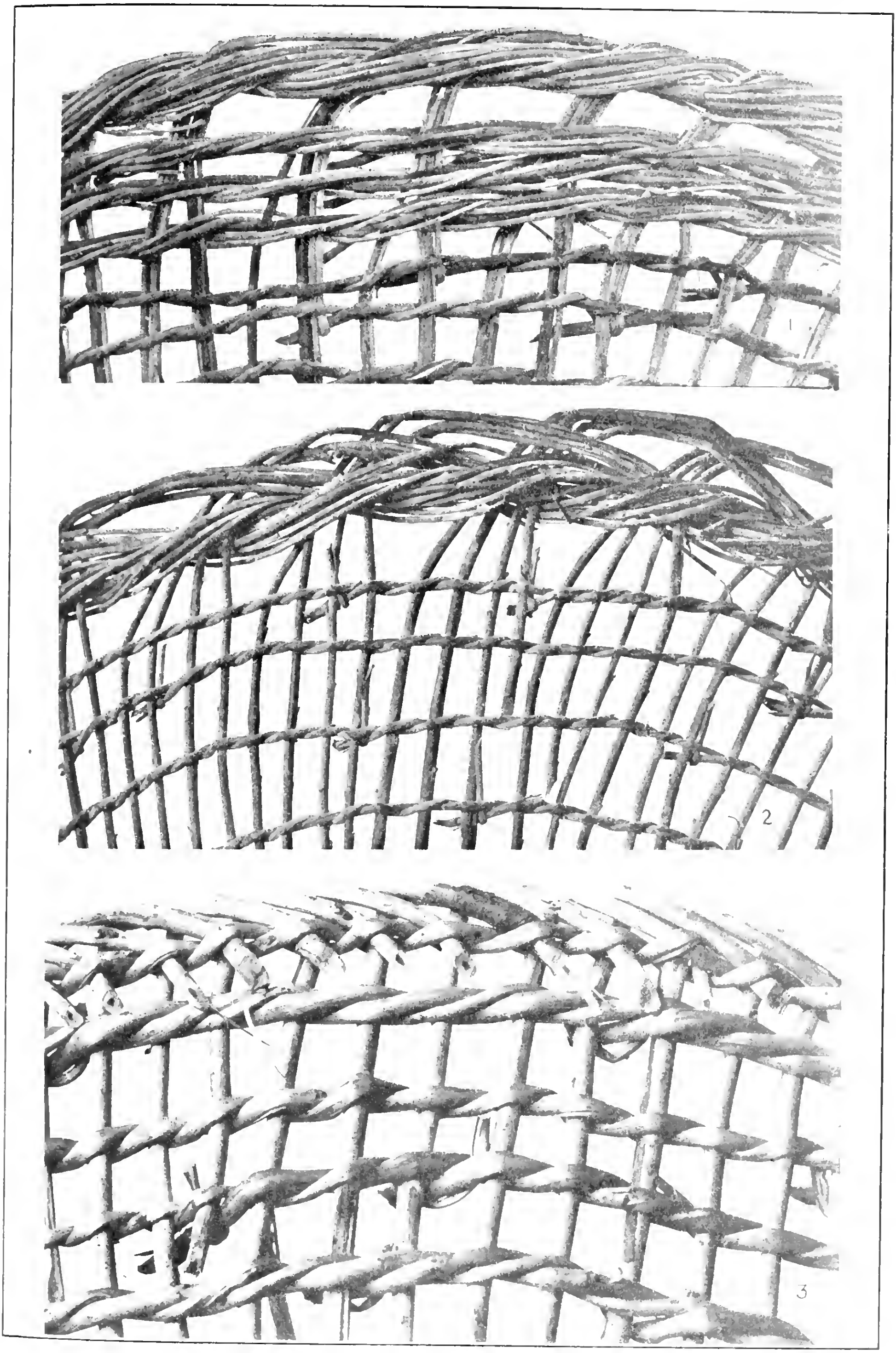
EXPLANATION OF PLATE 30.

Figure 1.—Twined border. No. 1-2604.

Figure 2.—Twined border having the appearance of braiding. No. 1-3040.

Figure 3.—Border with warp sticks turned down and caught under the last round of twining.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UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
AMERICAN ARCHAEOLOGY AND ETHNOLOGY

Vol. 7 No. 4

SHELLMOUNDS OF THE SAN FRANCISCO BAY REGION.

BY

N. C. NELSON

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SHELLMOUNDS OF THE SAN FRANCISCO BAY REGION.

BY
N. C. NELSON.

CONTENTS.

INTRODUCTION.

During the season of 1908 the writer completed a somewhat detailed survey of the evidences of prehistoric man in the San Francisco Bay region. The work, which had been under way for some time, was finished probably none too soon, because the obliterating agencies of nature have been strongly reinforced in the last four or five decades by the hands of modern man, and the ultimate destruction of every suggestion of former savage life seems not far off. Professor John C. Merriam, who directed the investigation, had himself for some years been collecting data on the subject, and a comparison of his results with our present knowledge shows only too plainly how rapidly the monuments and relics of primitive times are disappearing from the bay shores.

The field work connected with the present study represents a review of Professor Merriam's data, with the addition of much information that is new. In the course of three months, the writer traversed the entire country bordering San Francisco, San Pablo, and Suisun bays; including the tide-water districts of the entering streams and also a short strip of the Pacific Coast adjacent to the Golden Gate. The ancient remains discovered or re-examined include shell heaps, earth mounds, and a few minor localities that cannot perhaps be termed anything but temporary camp sites. Of the two most numerous forms, the earth mounds are nearly all located by the entering streams, close to the upper reaches of the tide-waters; and their number could be increased indefinitely by searching these stream valleys toward their sources. But as those rather common and widely spread accumulations appear, in many cases, to be of relatively recent origin and possibly representative of distinct cultures, the present paper is restricted to a consideration of the shell heaps.[1] These fairly numerous deposits, with a few exceptions, are situated close to the open bay and may, geographically at least, be regarded as a distinct group.

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[1] The earth mounds of Central California have been considered briefly by W. K. Moorehead in his Primitive Implements, p. 258; and by W. H. Holmes, *Smithsonian Report*, 1900, p. 176.

Thus far only three of the four hundred and twenty-five shell heaps composing the group have been carefully excavated, and those three were unfortunately on the same side of the bay and not very far apart.[2] Nevertheless, guided by this limited amount of intensive work, the rather more than superficial examination of all the remaining mounds, supplemented by such sifted information as could be obtained from owners and local residents, may allow some safe generalizations for the group. The purpose of this paper is, therefore, to show by a map the actual location of all the ancient middens known, to consider the broader facts apparent in the relation of the mound distribution to the local topography, and, finally, so far as is warranted by available knowledge, to make some comparisons of the mound group and its culture with that of similar occurrences in other parts of the world. The paper should be considered only a general or preliminary report which it is hoped may be expanded from time to time as further systematic investigation shall be made possible.

The support of the field work has been generously furnished by Mrs. Phoebe A. Hearst, through the Department of Anthropology. The study as a whole has been pursued as graduate work at the University of California, under the immediate direction of Professor Merriam, who has also kindly revised the manuscript and read the proofs.

THE SAN FRANCISCO BAY REGION, AS ADAPTED FOR PRIMITIVE HABITATION.

With the present tendency of historical research apology is scarcely required for devoting some attention to geography as in part the underlying basis of ethnic conditions. At the same time, science may doubtless easily overreach itself in the attempt to account all phases of human culture the product merely of external conditions, and the consideration of environment is not taken up here solely in order to explain archaeological facts, but is made necessary by the established relation between some of the shell heaps and certain events in the history of the local topography. That material conditions do play a fundamental

[2] See report on the Emeryville Shellmound by Dr. Max Uhle in Vol. 7 of the present series. Reports on the other mounds are awaiting publication.

part in human development is not to be questioned. Indeed it would seem as if environment had so particularly favored primitive human life in California that it must in the end be accepted as one of the chief factors in explaining the presence of the unusually numerous linguistic stocks, and the fact that they managed to exist within these narrow territorial limits without losing their identity.

GEOGRAPHICAL POSITION.

The relation of the region to be considered to the city of San Francisco makes its geographical situation a matter of common knowledge. Definitely fixed, the particular area concerning us is included between 121° 56′ and 122° 42′ west longitude and between 37° 23′ and 38° 18′ north latitude. In more general terms, the territory extends from the cities of Napa and Petaluma on the north to San Jose on the south and from the Pacific Coast eastward to the Great Valley, the respective distances being about sixty-five and forty-five miles. The bay itself, with its flood lands, covers approximately 120 square miles and is bounded by more than 300 miles of shore line.

PHYSIOGRAPHICAL AND GEOLOGICAL CONDITIONS.

The waters broadly designated by the term San Francisco Bay are confined to a series of connected depressions in the heart of the Coast Range. The mountain system referred to reaches its narrowest limits in this latitude, where its two or three main ranges have probably always been characterized by a general transverse sag, through which the interior basin of the state connected with the ocean. Since middle Tertiary times, the oscillating movements of the coast, amounting it seems to over 2,000 feet, have concentrated tidal and drainage currents on this pass until at the present time, when the land is relatively high, the enormous drainage of the interior basin reaches the ocean by way of an irregular line of deep gorges, cut through the three or four low barriers that still remain. Descending upon this transverse channel are some six or seven partly united and more or less directly opposable valleys, two from the south and the others

from the north; and it is these valleys which, after a partial re-submergence, have given rise to the present three divisions of San Francisco Bay.

The outermost and the largest of these divisions, that is San Francisco Bay proper, is an elliptical body of water about forty-five miles long and as much as twelve miles in width. It lies mostly south of the transverse channel and is flanked on the east by the Mt. Hamilton Range and on the west jointly by the Santa Cruz Range and the mountain block north of the inlet, of which Tamalpais is the culminating peak. At the present time its shores are generally low, marshy and unapproachable, except in certain places about the northern end. Here, especially on the west side, from San Bruno Point north, several secondary mountain features run out at an angle to the general trend of the shore line, producing an alternating series of inlets and headlands, the latter of which furnish easy approaches to the open bay. The resisting extremities of some of the most prominent of these headlands or peninsulas appear as islands in the bay; and one of these islands, the Potrero Hills, which was once a part of the western shore, has recently, by sedimentation, been linked to the opposite shore, while the originally insulating channel furnishes the only entrance to the second or central compartment of the estuary, namely San Pablo Bay.

San Pablo Bay is a roughly circular twelve-mile expanse, actually called Round Bay by the early Spanish explorers. It is walled in on the west by the same mountain block that separates the lower bay from the ocean but on the east by only a low and narrow strip of the Mt. Hamilton Range. On the north it sends three long tidal arms up the Napa, the Sonoma and the Petaluma valleys—now all choked with silt; while on the south it meets, somewhat abruptly, a broad section of the Mt. Hamilton Range. In other words, the basins of the two lower divisions of the estuary do not meet end to end but are roughly parallel and connect at present by a diagonal channel, the San Pablo Strait.

San Pablo Strait, like the Golden Gate below and Carquinez Strait above, appears to be the joint result of subsidence and wave erosion, completed perhaps within recent geological time, but still prior to the oldest records of the shellmound people in

the region. Probably the older channel, or at any rate the truly structural connection of the two basins, ran between the Potrero Hills and the Mt. Hamilton Range. This passage is now practically obstructed by the joint deltas of the San Pablo and Wildcat creeks, forming the plain on which the city of Richmond is building. The delta material, containing shell strata in places, is over 500 feet deep; and upon its surface are situated some of the largest and oldest of the shell heaps.

To the east of the remaining narrow portion of the Mt. Hamilton Range is the third and smallest of the estuary divisions, usually distinguished as Suisun Bay. The basin containing this body of water is now largely open to the Great Valley, subsidence and erosion having removed or obscured the dividing ridge. The result is that Suisun Bay, almost entirely silted up and reduced to tule marsh, appears to be topographically one with the adjacent floodlands of the Sacramento and San Joaquin rivers. These stretches of level floodlands, extending over a large area of the lower portion of the Great Valley, are marked by certain noteworthy features in the form of isolated sand dunes, rising like islands through the surrounding peat which often attains a depth of forty or fifty feet. We may leave the origin of these eminences for others to explain, but they are particularly interesting to the archaeologist by reason of the fact that they furnish evidence of having been more or less permanently occupied by the aborigines. (See pl. 35, fig. 2.)

Whether Suisun Bay has been large enough or deep enough to admit the sea since prehistoric times seems doubtful. There are, on the one hand, several old beach marks along its shores, and the lowest of these is not many feet above the present water level; but, on the other hand, the very largest and perhaps the oldest of the shell heaps in the Suisun Bay basin, no. 250, near Concord, lies approximately at sea level and may therefore have been begun at a time when the bay was even smaller than to-day. To be sure, there are other shell heaps in the vicinity of Martinez and above Cordelia that lie on higher ground, but these are insignificant, in fact almost obliterated, and do not furnish any reliable tests. In view of these facts it will seem natural enough, therefore, that the remainder of this study should be restricted

almost entirely to conditions as they exist on the two lower divisions of the estuary.

The basins of San Pablo and San Francisco bays may, for our purposes, be considered as a unit and as physiographically distinct from the Great Valley, although receiving and transmitting the immense drainage of the latter. Being quite limited in extent, the watershed belonging to the basin is unable to develop any large streams. There are some sixty named and recognized water-courses, besides many more wet-weather gullies that descend from the surrounding hills; but of those named only the Guadalupe and the Coyote at the southern extremity and the Napa at the northern, are dignified by the doubtful term "river." Those three, together with the Sonoma and the Petaluma creeks, also on the north, are the only permanently flowing streams native to the basin. Of the remaining creeks, however, many, such as the Rodeo, the San Pablo, the San Leandro, the San Lorenzo, and the Alameda on the east side, and at least the San Francisquito and the San Mateo on the west, would under normal conditions, flow at all seasons of the year; and would, consequently, be lines of attraction for primitive populations. As it is, the water of nearly all the streams has been diverted in the foothills to satisfy the requirements of modern civilized life.

In connection with this preliminary statement of the physical features of the bay region it seems desirable also to call attention to the influence of the drainage entering or passing through the bay. The processes of erosion and of deposition are both in action at the same time and often in close proximity; but the wearing-down work is generally confined to the central section of the bay and the building-up process to the extremities. It is along the line of the great current from Carquinez Strait to the Golden Gate, and at a few other points on the lower bay, as far south as the latitude of San Mateo, that wave erosion is apparent. Wherever the projecting headlands reach the open waters high and steep cliffs are usually present. These cliffs have either been worked out since the last subsidence or are holding their own concomitantly with a slow sinking movement, of which it appears that at least the last eighteen or twenty feet have taken place since man's

occupation of the region. Either supposition indicates a considerable age for some of the shellmounds.

The most readily observable progress of erosion is of course confined to the recent formations, such as the soft conglomerates about Point Pinole and the gravels and clays of the alluvial slope bordering most of the lower bay. Perhaps the most notable wave work within historic times is that on the east shore, between Oakland and Richmond, where the marsh belt and the detrital slope have been eaten back for a considerable distance. The waves have here in all probability also cut away a number of the ancient shell heaps.

But the tearing down processes about the bay are more than counterbalanced by those that build up. In the first place, subaerial erosion in the flanking mountains has produced an alluvial slope extending from San Bruno Point around the south end of the bay and along the east side almost to Point Pinole. This slope, upon which are built some of the principal bay cities, varies from one-half mile to five or six miles in width, being most prominent off the points where the larger streams issue from the foothills. The deltas of the San Pablo, the San Francisquito and the Alameda creeks show even a fan-like contour; and the last named fan has thrown a dam across the mouth of a small lateral valley giving rise to several minor lagoons near the foothills, between the towns of Irvington and Niles. The shores of these fresh-water lagoons furnish distinct evidence of permanent settlements in former times, and the fact that the old San Jose Mission is located very near seems in a measure to warrant the opinion that the Spaniards found Indians living in that locality.

In the second place, there are the notable results of the deposition of the suspensible matter brought into the quiet waters of the bay by the streams. Almost the entire bay is fringed with a belt of tide-land, salicornia marsh, which attains a width of from three to five miles at the extremities and is absent only in the constricted central portion, chiefly about the heads of the more prominent peninsulas. Some vegetable matter enters into this marsh composition but it is made up chiefly of a very fine bluish silt. The sources of this silt and the rate of its deposition have probably been much altered in the last fifty years. There

can be no doubt, for example, that the supply has been at once appreciably reduced for the smaller streams and increased for the Sacramento and San Joaquin rivers, whose carrying powers have been much increased by the confinement of their channels. Whether or not this change has worked any rapid transformation in the upper bay is not known; but it is a fact that at the present time the open waters of the entire San Pablo Bay, excepting a broad channel across the southeastern half, average less than ten feet in depth at mean low tide.[3] A similar condition is true also for San Francisco Bay below the latitude of San Bruno Point, save for a narrow, central channel which still maintains a depth of about forty feet. These facts regarding the deposition of silt are more or less relevant to the archaeological problem, because the continually widening marsh belt has left many of the shell heaps quite far from the open waters, suggesting that a large part of the depositional work was done since the middens were abandoned. Furthermore, several of the shell heaps situated on the tide lands are deeply imbedded in the silt itself.

This partial submergence of mounds in the tide-lands furnishes occasion for a final word with reference to the recent subsidence of the bay region. There is of course no question about the origin of San Francisco Bay. Its very setting is suggestive, and examination of the details of the shore line could not leave even the untrained observer in doubt. Nor should it have been necessary to investigate the shell heaps for evidence of recent subsidence. The manner in which the foothills descend directly to the marsh level, without any intervening alluvial slope, would seem sufficient proof. Similar suggestions are also furnished by the small islands scattered in the marsh along the western shore from Petaluma to San Mateo. And on the east side, well towards the southern extremity of the bay, the Coyote Hills, a narrow range several miles long, rise about three hundred feet out of the

[3] In 1775, when José de Cañizares, pilot to Commander Ayala of the San Carlos, made the first reconnaissance of the bay region with copious soundings of the estuary, he found, at low tide, about five feet of water in San Pablo Bay outside the main channels. He also mentions two large harbors (now silted up) on the west shore and a large body of open water in what is now Petaluma Slough. See translation of Ayala's report by E. J. Molera, with photographic reproduction of the original map of San Francisco Bay, in *The March of Portolá*, published by the California Promotion Committee, San Francisco, 1909.

marsh,—a particularly striking example of the many outcropping remnants of the older drowned topography.

CLIMATE.

California is distinguished as perhaps the most unique of the world's thirty-four climatic provinces. No other territory covering an equal extent of latitude shows the same uniformly mild temperature. Certain sections of the west coasts of South America and of British India offer the nearest approach to California conditions, but in those places the mean annual temperature is 10° Fahr. higher than in California. This does not mean that extremes are wanting in specific localities in California. Far from it: the state not only reaches over a great extent of latitude but its altitude ranges from 400 to 500 feet below sea level, in Death Valley, to the horizons of continual snow in the mountain ranges. It is owing chiefly to the fortuitous combination of the warm ocean currents and the general arrangement of the broad features of relief that the really habitable portion of the state possesses an equable temperature which is highly favorable to vegetable and animal life. Broadly speaking, the climate is sub-tropical; and that of the San Francisco Bay region, tempered as it is by the prevailing ocean winds, may be characterized as insular.

Two seasons, a wet and a dry, are to be sharply distinguished. The rainy period may be said to last from October to April and is on the whole the pleasantest part of the year. The precipitation, which increases rapidly with the latitude, for San Francisco ranges from 23 to 28 inches. Snow is a rare sight and frost seldom touches the low country about the bay. The prevailing winds are from the southwest during the dry season and it is these that bring the fogs. Winds blowing from the opposite direction sometimes bring the heated air from the interior valleys and produce the only hot spells that may be experienced in the bay region. The mean summer temperature for San Francisco is about 60° and the mean winter temperature about 51° Fahr. The mean annual average for thirty-one years is 56° Fahr., while the extreme annual range is only about 60° Fahr.

FLORA AND FAUNA.

The particular configuration of the state, which in a large measure causes the remarkable uniformity of temperature in certain regions, introduces also the important element of variety. This whole phenomenon is perhaps best expressed in terms of the flora and fauna. The life zones range from arctic down to subtropical; and this fact, combined with the general geographic position of the region, has resulted in a remarkable diversification of the plant and animal life.

The San Francisco Bay region itself, while appearing to contain all of the more valuable economic plants of the state, could probably never have furnished the variety found in some other parts of this large political division. This specific section of the Coast Range is quite limited in extent as well as relatively low, and the general northwest-southeasterly trend of the relief gives only a small amount of favorable exposure. The hills on the east and north sides of the bay are therefore almost barren, except in the minor side canyons; but on the west, where the ranges are more thoroughly broken up, the vegetation is fairly luxuriant.

In the valleys, and on the lower foothills bordering the bay, grow several species of oak, especially the Valley Oak, *Quercus lobata*, and two Live Oaks, *Quercus agrifolia* and *Quercus Wislizenii*. The willow, *Salix*, is also common along some of the streams crossing the border plain. Farther back, in the canyons and on the hillsides, flourish the Mountain Laurel or Bay tree, *Umbellularia californica*, and the Buckeye or Horse Chestnut, *Aesculus californica;* and close to these may be found two or three species of the manzanita, *Arctostaphylos*, and the hazel, *Corylus californica*. Finally, in the higher hills appear several conifers among which are the Douglas Spruce, *Pseudotsuga taxifolia;* the Hemlock, *Tsuga heterophylla;* the Yellow Pine, *Pinus ponderosa;* and the Digger Pine, *Pinus Sabiniana*. The Redwood, *Sequoia sempervirens*, is also quite abundant, especially on the sea side of the western range. Besides these larger trees, the products of most of which have been used in some way by the Indians of late times, there are two or three species of the wild cherry, *Cerasus;* a plum, *Prunus subcordata;* and a huckleberry,

Vaccinium ovatum. The Elderberry, *Sambuscus racemosa,* and Wild Grape, *Vitis californica,* are also common. Finally, there are several of the common berries such as the Thimbleberry, *Rubus parviflorus;* the Blackberry, *Rubus vitifolius;* and several species of gooseberry and currant, *Ribes;* in fact the saxifrage family is well represented, though it is perhaps not as valuable here as elsewhere.

Of the smaller flora in the region many families are unusually well represented. Among the most common of these are the sunflower family, *Compositae;* the mustard family, *Cruciferae*; the crowfoot family, *Ranunculaceae;* the poppy family, *Papavraceae;* the pea family, *Leguminosae;* and the lily family, *Liliaceae.* There are about thirty different species of lily bulbs and of these the famous Indian soaproot, *Chlorogalum pomeridianum,* is very abundant. Many other useful plants such as the Milkweed, *Asclepias mexicana,* and various grasses and sedges are also found.

No detailed study of the local flora has been attempted or deemed necessary in connection with this shellmound investigation inasmuch as it is not possible to determine to what extent the prehistoric inhabitants utilized vegetable products.[4] It may be worth while, however, to cite the results of Mr. Chesnut's recent studies among the Indians of Mendocino County, which adjoins the bay country on the northwest.[5] Mr. Chesnut lists and describes the various uses of no less than 212 plants in that region and shows how thoroughly versed primitive peoples may be in the botany of their respective habitats. It is not known just what the difference in geographical distribution may be, but certainly the majority of the economic plants of Mendocino County are to be found also in the vicinity of San Francisco Bay.

The indigenous fauna of California is now much depleted, but there can be no doubt that it once corresponded to the flora in richness. There are some three hundred and fifty species of birds in the state; and of these many of the game birds were until late years very plentiful in the bay region. Of the mammals the state contains fifty-three out of the sixty-six genera in North America,

[4] For a full account of the flora of the region consult Jepson, W. L., Flora of Middle Western California, 1901.

[5] Chesnut, V. K., Plants used by the Indians of Mendocino County, California. *The U. S. National Herbarium,* Vol. III, No. 3.

and the species number about two hundred and seventy-five.[6] But several of these have been much thinned out, and some, like the antelope, *Antilocapra americana*, have disappeared entirely. All the more useful mammalian orders such as the cetaceans, the ungulates, and the rodents were once well represented in the bay region. The particular species hunted in prehistoric times will be enumerated later in the paper and need not be given here.

Fishes also, especially the salmon, were supposedly always plentiful; but it is difficult to determine whether or not the primitive inhabitants were able to fish successfully in so large a body of open water.[7] The minor streams entering the bay afforded far more favorable opportunities; but these water-courses probably never contained more than a limited number of small species. It appears, however, that at the present time these streams are continually being restocked from the Sacramento and San Joaquin rivers, probably during the excessive spring floods.[8] Finally, the shoaling bay was well stocked with molluscs, particularly the mussel, *Mytilus edulis*, and the clam, *Macoma nasuta*,—a fact which may have drawn the first settlement to its shores.

We have then, to sum up the environmental conditions, a large body of water, favorably isolated and sheltered by encompassing mountains. The bay itself is extensive and broad enough to constitute a natural barrier for people without well developed means of navigation; and the border country, which is either partitioned by low mountain ranges or is suitable for habitation only along the widely separated streams, also tends to develop a certain degree of isolation and thus favors segregated community life. Under former normal conditions the hill slopes and the valleys of the region were tolerably well supplied with fresh water; while food products of all kinds were plentiful and near at hand. When we add to these characteristics a climate as

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[6] Stephens, F., The Mammals of California, 1906.

[7] The pilot Cañizares, already referred to, found in 1775 an Indian rancheria near the west end of Carquinez Strait, where various kinds of fishes (among them salmon) were offered the explorers as presents. See *The March of Portolá*, p. 66.

[8] J. O. Snyder, Notes on the Fishes of the Streams Flowing into San Francisco Bay. *Report of Bureau of Fisheries*, 1905; p. 329.

favorable as is known, it should be no cause for wonder if the human species early seized upon the region for permanent habitation.

DISTRIBUTION OF THE SHELLMOUNDS.

PRESENT NUMBER.

The group of shellmounds examined in the San Francisco Bay region and located on the accompanying map numbers 425 separate accumulations. It is not to be supposed, however, that this figure exhausts the evidences of aboriginal occupation to be found within the given territorial limits, because the shellmounds are confined to a narrow belt around the open waters of the bay and grade off landwards into earth mounds of a more or less artificial character. In fact, some of the deposits shown at the northern and southern extremities of the map, specifically those on Sonoma Creek and on the Napa and Guadalupe rivers, contain a larger percentage of earth and ashes than of shell. According to reports, moreover, earth mounds and "old Indian rancherias" are situated on the banks of the Alameda and San Francisquito creeks, above the alluvial plain in the foothills; and it is hardly to be doubted that sites of this character could be found in great numbers by following up any other of the minor streams. As it is, several more or less obliterated camp and village sites of late and ancient date are definitely known in the region, some of them even on the University Campus in Berkeley; and the publication of news items relating to discoveries here and there of relics and skeletal material is no uncommon occurrence.

The now known list of genuine refuse heaps certainly falls short also of the number that originally existed in the region. Many of the deposits appear to have been either obliterated or destroyed by natural causes. Thus there were discovered, quite by accident, four shell heaps of unknown lateral extent, but from one to three feet deep, that were completely covered by natural deposits, ranging in thickness from one to two and a half feet. Of these four, no. 6 lies at the bottom of Elk Canyon, northwest of Sausalito, and its covering is simply a light sandy alluvium; but nos. 4 and 15, below Mill Valley, lie on hillsides and the covering here is a hard clay or adobe that could have washed

from the slope above only very slowly. The last, no. 96, situated west of Point San Pedro, lies in the edge of a reclaimed salt marsh, and was discovered only through the presence of a ditch lately dug across the area containing the buried deposit.

Another point worthy of note is the fact that there are at the present time no less than thirty relatively large mounds so situated by the shores, central on the bay, that they are subject to wave action (pl. 34). Some of these mounds have their foundation below sea level while others are raised on high bluffs and cliffs; but they are all alike disappearing, though necessarily at very different rates. One such mound, no. 266, situated on the bay shore north of San Pablo Creek, has been washed away within the last three or four years, the only signs of its former presence being certain fragments of worked stone and a few human bones that lie scattered over the muddy beach.

The suggestion that some of the deposits examined have their bases below sea level is of special significance and will be considered in detail later; it will be enough to state here that the subsidence appears to have affected the entire San Francisco Bay region, and that it is of such magnitude as to make it seem probable that a large number of mounds may have sunk entirely out of sight.

In addition to these natural forces, acting in the capacity of destroyers, there are to be taken into account several artificial agencies. Thus agriculture has been practiced more or less intensively in the region for over one hundred and twenty-five years; and, judging from reports as well as from conditions at the present time, it is not improbable that many of the mounds have been either plowed down or literally removed. In a number of cases where mounds have evidently disappeared in recent years, reliable information was not to be obtained. The majority of the country population, especially around the northern end of the bay, are Portuguese ranchers, mostly of the first generation, who know little or nothing about the recent history of the region. A little experience made it evident that negative information was not to be implicitly relied upon. All the more suitable places, such as springs and streams and canyons, were visited; but very often mounds of comparatively large size were found by chance in what appeared to be most unnatural situations.

All the foregoing circumstances clearly confirm the opinion that the original number of shell heaps on the San Francisco Bay shores may have been much larger than the figure now given, and that indeed this figure may not even include all the deposits existing at the present time. As to the latter point, however, it is fairly certain that no mounds of any considerable size or special importance are left unnumbered.

APPEARANCE, SIZE AND STATE OF PRESERVATION.

To detect the presence of a shell heap, even if inconsiderable in size, is not as a rule a very difficult task. During the dry season, and especially after the crops have been removed or the natural vegetation has died down, a slightly bluish tinge, imparted by the mussel shells, distinguishes these places often at a considerable distance. So also, immediately after the first heavy rains, the mound material being unusually rich and vegetation quick to respond, the sites lie revealed here and there before the observer as richly green spots in the generally barren, dull-colored landscape. Another fact which drew attention to the deposits was a frequently accompanying growth of buckeyes (*Aesculus californica*). Indeed, after the relation once became apparent, the discovery of a group of these trees often became an irresistible argument for making long detours into parts otherwise judged unsuitable for mound sites. As a rule trees do not grow directly on the mounds, unless there happens to be a good deal of earth mixed up with the shell and ashes; and the presence of the buckeyes immediately about the deposits is somewhat of a puzzle. It is well known that the Indians of recent times prepared the large, bitter nuts of this tree for food. They are said, moreover, to have used its soft wood for making fire and to have believed in the medicinal virtues of its bark. There can be no doubt, therefore, that at least the latest of the shellmound people also used some of the products of this tree; but it is impossible to say whether they planted the trees about their camps or whether the sites were originally chosen because of the presence of the trees. The latter alternative seems hardly tenable however; and neither may be correct, as the trees in many instances (*i.e.*, where they grow on top of the mounds), must have developed from seeds scattered perhaps accidentally at the time of the departure of the inhabitants.

Certain definite physical conditions, such as the presence of fresh water, timber, shelter from the wind, and easy access to the sea shore, appear to have controlled the location of most of the camps; and the presence of these elements, singly or in combination, in turn yields valuable guidance. Fresh water was probably one of the first essentials, and it is often to-day a matter of superstitious conviction with the old settlers that "wherever you find an Indian mound, there you'll find water—if you look long enough." Generally the connection holds, but not invariably, and this partly by reason of the geological changes which have taken place in the region since the shellmounds were begun.

The size and form of the shell heaps, while often much altered by one cause or another, are still in most cases approximately determinable. For instance, if a mound has been partly hauled away, abundance of material made economy unnecessary, and the thinner peripheral portion is usually left undisturbed. Actual dimensions vary greatly. Thus the basal diameters range from thirty to six hundred feet, and the height runs from a few inches up to nearly thirty feet. Curiously enough, the famous mound referred to the San Francisco Bay region by Southall and De Roo,[9] and probably the same that Marquis Nadaillac[10] locates at San Pablo, was not found; and in spite of the fact that it is definitely described as measuring one mile by a half-mile across and as having a height of over twenty feet, it appears never to have existed. There are, however, three mounds of more than average size in the vicinity of the old Spanish town, and the circumstance that these lie within the area of half a square mile may possibly have given rise to the error.

The typical shell heap of the San Francisco Bay region is oval or oblong in outline, with smooth slopes, steepest of course on the short transverse diameter; and the longer axis is generally parallel to the shore-line or stream to which the pile may be contiguous.

A remarkable fact about the accumulations is that while they are made up of comparatively loose material they do not appear to weather appreciably. This may be due partly to the resisting

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[9] P. de Roo, Hist. of Am. before Columbus, p. 54.

[10] Marquis de Nadaillac, Prehist. Am., p. 50.

quality of the shells and partly also to the binding power of the broken fragments which, when laid down horizontally, may in some degree resemble loess in structure, and, like loess, cave less readily than ordinary soil. To illustrate this binding power may be cited the fact that it has been found safe and practicable to sink a vertical shaft, six feet square, through twenty-five feet of the material without the provision of a curbing. In one instance such a shaft was carried about twelve feet below sea level, but even the strong head of water failed to break down the walls. At the surface, the shell disintegrates somewhat, but probably more in consequence of vegetal processes than those of weathering. It would appear therefore that under perfectly natural conditions the configuration of the mounds would have remained perhaps almost unchanged for many decades, if not for centuries; and they might in that condition have told a valuable story. As it is, on account of recent artificial disturbances, it is generally uncertain precisely in what state the mounds were left. Nevertheless, a few of the larger and better preserved examples present roughly flattened tops and in two instances these surfaces are dotted with distinct saucer-like depressions, as of house pits.

The state of preservation of the mounds, just touched upon, is a matter of some consequence. It so happens that the majority of the larger accumulations lie precisely in the places since found suitable for habitation by the modern invaders, and therefore have to give way to the requirements of civilization. Towns are growing up in the principal valleys favored by the shellmound peoples; and in the canyons, as well as on the plains, ranch houses often cluster about, and not infrequently occupy the summits of these ancient dwelling sites. The accumulated refuse has also been found useful in many ways. For example, the composition will sometimes yield splendid crops of potatoes and other vegetables; and this fact, as it has become known, has generally led to reduction and cultivation of the mounds. In addition to this source of destruction, the material is removed to serve a variety of purposes, such as ballast for roads and sidewalks, as garden fertilizer, and even as chicken feed. It is said that the mound material, mixed with rock salt, produces tennis courts that for combined firmness and elasticity are unexcelled. The result is

that while there is still ample opportunity for the investigator, not a single mound of any size is left in its absolutely pristine condition.

Many of the accumulations, as indicated on the map, have disappeared in recent years, leaving only the faint traces that lead to inquiries, and usually to only very general results. The artifacts from these obliterated deposits have as a rule been scattered broadcast among individual curio seekers; and even when found in more or less representative groups, there are no accompanying data. It is said that a good share of the archaeological material from the two large mounds formerly located in the town of San Rafael found its way to the British Museum in London; but, according to the informant who claims to have culled the deposits for the one-time English consul at San Francisco, no detailed records went with it. From only two more of the destroyed sites is any collection known to be extant. The Golden Gate Park Museum of San Francisco obtained some years ago a small but quite complete culture exhibit from mound no. 276, at one time located in the yards of the Standard Oil Company at Richmond; and only recently the city of Alameda collected a small group of implements from no. 316, a large shell heap formerly located near the intersection of High Street and Santa Clara Avenue.

Exclusive of the results obtained in the systematic work carried on during the last six years by the University of California, there are only a few minor collections from mounds still partially intact. The Stanford University Museum is in possession of several pieces from no. 356, near Mayfield; the owner of no. 3, at Sausalito, shares with the public school of that place a collection of skulls and stone implements; and from no. 199, at Lakeville, a small exhibit has found its way to the Dime Museum in Petaluma. All of these collections, while taken from scattered sites, are numerically small and probably in no case fully representative of the given culture, and cannot therefore furnish an entirely safe basis for comparison and generalization. Enough is known to warrant the statement that a general similarity in culture obtains for the entire region; but the differences, if any, remain to be brought out clearly.

SITUATION WITH RESPECT TO SHORE-LINE AND SEA-LEVEL.

The shell heaps under consideration are situated in a great variety of places; but, on the whole, the positions may be characterized as *convenient* rather than in any sense *strategic.* Many of the largest mounds are located at the head of the sheltered coves, yet not a few deposits lie in thoroughly exposed places, out on the bluffs and higher headlands. Occasionally a hillside, with or without any accommodating shelf or hollow, has been chosen, doubtless on account of some small spring issuing in the vicinity. Good illustrations are furnished by no. 65, at Corte Madera, and no. 379, near South San Francisco. From San Rafael northward nearly every ravine and every gully appears to have offered attractions. But the great majority of the mounds are situated on or near the small streams, though with considerable indifference, it seems, as to whether the surrounding country is barren plain or timbered hills. Wherever a group of separate deposits line a stream it is usual to find the largest accumulations at the lower end of the series. Lastly, some mounds are found in apparently unnatural situations, such as on the plain where no streams pass, or out in the salt-marsh where fresh water could not be had; and a few deposits are to be seen also on the small islands, both those immediately surrounded by marsh and those which are completely insulated by deep and swift currents.

Normally the shell heaps lie quite close to the open waters. The only general variation from this rule occurs on the north and northwest, where some of the deposits are situated four or five miles back from the present shore. But it seems legitimate to assume in explanation of this fact that at least the larger and older of the accumulations in this locality were begun, if not actually abandoned, prior to the building up of the now broad belt of reclaimable marsh, away from which they do not in any case extend very far. A more singular and striking exception occurs on the east, between Rodeo Creek and Carquinez Strait, where two neighboring mounds are situated comparatively far inland and at unusual elevations. Thus no. 254, directly east of the town of Rodeo, is located nearly one and one-fourth miles back from the shore, at an approximate elevation of two hundred

and twenty-five feet; and south of this mound, on Rodeo Creek, lies no. 259, which is over two miles inland and about one hundred and twenty-five feet above sea level. Both were extra large mounds and probably of relatively great age.

The unusual situation of the two deposits mentioned above, while suggestive perhaps of a local rise, may after all be perfectly normal. The barren hills close to the shore offer little attraction, while back in the canyons, where the mounds lie, the laurel and the oak find existence possible on the shaded slopes, about the springs and along the wet-weather gullies. There is also the further argument against a recent upward movement, namely, that within two or three miles on either side of the elevated deposits several shell heaps of more than average dimensions are situated at sea level, with indications of having been lowered into their present position. Among these apparently lowered deposits may be specified no. 236, at the head of Glen Cove on Carquinez Strait, and no. 262, on the San Pablo Bay shores, southwest of Pinole. But, whatever may have taken place in this particular locality, there can be no doubt about the subsidence of the bay region as a whole or concerning the fact that however ancient or slow this movement, the latter portion of it was witnessed by man.

As a natural consequence of favoring proximity to the open shore, the shell heaps tend to keep close to sea level. The fact is that nearly all the mounds lie within fifty feet of the surface of the bay waters, and this may be termed the normal zone. But exceptions occur on either side of this zone; and these, because of their numerical scarcity, are perhaps all the more significant. We have already seen that two mounds lie very far above the normal zone, and there remains only to state that at least ten of the known deposits extend below sea level. Most of these sunken accumulations, it is true, occur in the central part of the region, about Berkeley and Richmond, and also on the opposite shore, near Tiburon; but good examples are not entirely wanting at either extremity. Thus to the north one large mound lies well out in the Petaluma Creek marsh, off Lakeville; while to the south there remains at least one small shell heap, scarcely noticeable any longer, out on the reclaimed flood lands on the north bank of the

Coyote River; and there is evidence that two additional deposits once lay on the marshy shore near the south end of the Coyote Hills.[11] Besides these ten or twelve partially submerged accumulations, there are also the scattered deposits previously mentioned as giving indication of having been lowered to their present position, within reach of the waves.

The foundations upon which the submerged refuse heaps rest are generally of firm material, excluding the possibility of the accumulated weight of the mound having forced the mass below sea level. Several of these unique deposits lie on the alluvial slopes; but others, such as those on Brooks Island (pl. 34, fig. 2) and at Tiburon, rest on older formations, even upon solid rock. Up to the present time only three of the ten submerged deposits have been carefully tested for depth, and these show a subsidence ranging from three to eighteen feet.

GEOGRAPHICAL DISTRIBUTION AND ITS CONTROL.

A glance at the map will show the relative frequency of the shell heaps along the bay shore to vary somewhat locally. It is uncertain, of course, what the original geographical distribution may have been, on account of the disturbing factors, more or less active, all around the bay. At the same time, it is hardly to be doubted that economy was in some sense a primitive trait, or that these rude savages had intelligence enough to take advantage of a combination of favorable circumstances. At any rate, judging from present conditions, the general scarcity of mounds at the extremities of the region under consideration does not seem inexplicable. The southern arm of San Francisco Bay can not now be regarded as entirely suitable, even if molluscs were abundant: and there is no indication of any very recent change from a better to a worse condition. To be near the main source of animal food would often mean to be several miles distant from the foothills which yielded wood, acorns, berries, etc. And granted even that the alluvial slope was covered with live-oak, which is not at all probable, the water supply close to the shore-line, would still be

[11] Since formulating the above statement the writer visited Halfmoon Bay to locate the mounds thought to exist in that region and thus to complete the survey of the coast line included in the accompanying map. Several mounds were found here and the largest of these, situated just inside Pillar Point, lies well out in the marsh and certainly goes below sea level.

a very uncertain quantity during the dry season. Finally, to judge from the nature of the shell heaps now remaining about the southern end of the bay, molluscs then as now, were not plentiful or were not easily obtained. Central on the bay, however, and especially on the west side from San Mateo to Petaluma, the more or less wooded hills, charged with springs and streams, come in many places directly to the open water and here, consequently, as might be expected, the mounds are relatively numerous. On the east side, from Alameda to Carquinez Strait, the deposits are also at intervals quite well represented both as to number and size; and this fact can hardly escape relation to another fact, namely, the comparative narrowness or entire absence of the alluvial plain, which brings the small wooded canyons within easy reach of the shore. There is one exception to this generalization in the case of the mounds located on or near the Potrero Hills in the vicinity of Richmond; for here, at the present time at least, both water and wood are practically absent. It may be assumed, however, that recent changes have removed these necessities or else that an extraordinary abundance of shell fish was the compensating element.

Reasonable proof of the suggestion that the presence of shell fish was the first essential to a camp is furnished by the ocean shore. Conditions have been closely studied here for about two hundred miles adjacent to San Francisco Bay, *i.e.*, from Halfmoon Bay to the mouth of the Russian River; and the results are not without interest. Water and shelter are easily obtained and timber also is fairly abundant north of the Golden Gate; but the nature of the beach is either unfavorable for a molluscan fauna or is too steep and difficult of approach. Consequently, within the mapped limits, mounds are scarce except at the head of Halfmoon Bay, where shelter is good though timber is lacking. The few deposits indicated along the coast northward are often not even near any of the predisposing elements, but lie exposed on high barren rocks and sand dunes. But along the coast immediately to the north of the map, shell heaps, though usually small, are very numerous, particularly on Tomales and Bodega bays where all the favorable conditions obtain.

NATURE OF THE SHELLMOUNDS.

GENERAL STATUS OF SHELLMOUND INVESTIGATION.

Since the first recognition of their place in culture history, artificial heaps of shell have been observed in many parts of the accessible world. They occur not only on various of the islands and along the continental shores, but have been traced inland along the rivers and their lacustrine ramifications, being here often partially or wholly replaced by accumulations of earth. Even the more isolated lakes of the far interior, whenever capable of supporting molluscan forms of life, appear to have attracted more or less permanent settlement of primitive peoples. In brief, it seems to be true that, given the proper environment, these accumulations have been found wherever due search has been made.

Actual study of the contents of these shell heaps has not yet proceeded very far on a world scale. Aside from the initial work in Denmark,[12] begun in 1851, systematic investigation seems to have been carried on most extensively in the United States, specifically in Florida[13] and the adjacent Atlantic and Gulf states, on the Aleutian Islands,[14] and in the Puget Sound country.[15] Some minor studies have also been made in scattered places on the Pacific Coast from the Columbia River to Southern California, as well as on the Atlantic shores from Virginia to Labrador. There are besides, for the world at large, some more or less complete records of investigations in such widely separated localities as the West Indies,[16] Brazil,[17] Chili,[18] Peru,[19] Japan,[20] Australia,[21] Italy,

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[12] Smith. Rep., 1860; also Affaldsdynger fra Steenalderen in Danmark by Sophus Muller, K. J. V. Steenstrup and others, Kjöbenhavn, 1900.

[13] Moore, Clarence B., Certain Shellheaps on the St. John's River, *Amer. Naturalist,* 1904. Also this author's publications by the Academy of Natural Science of Philadelphia.

[14] Dall, W. H., Tribes of Extreme Northwest, *Contrib. N. Amer. Ethnol.,* Vol. I.

[15] Smith, H. I., *Mem. Am. Mus. Nat. Hist.,* Vol. I, part 6; Vol. II, parts 4 and 6, of the publications of the Jesup Expedition.

[16] Fewkes, J. W., The Aborigines of Puerto Rico, *Ann. Rep. Bur. Amer. Ethn.,* 25, p. 275.

[17] Reclus, J. J. E., The Earth and Its Inhabitants, Vol. II, p. 88.

[18] Evans, O. H., Notes on Stone Age in Chili; *Man,* London, 1906.

[19] Uhle, Max., Los Kjoekkenmoddings del Peru; *Rev. Hist.,* Lima, 1906.

[20] Morse, E. S., Shellmounds of Omori, *Univ. of Tokio Pub.,* 1879.

[21] Roth, W. E., *North Queensland Ethnog. Bull.,* No. 3, 1901, p. 7.

Spain,[22] France, and the British Isles. In many cases, however, the work seems to have been inadequate for rigid analysis; and the present study, which is scarcely more than superficial, must therefore be limited to comparisons along only the broadest lines.

RELATION OF SHELLMOUNDS TO OTHER PRIMITIVE STRUCTURES.

The abundance and world-wide distribution of shellmounds may, it seems, be considered as tending to indicate the wide distribution of the human race by the time it had begun effectively and consistently to devise improvements on nature. The shell heaps are themselves a species of invention; and as such they are particularly interesting from a psycho-historical point of view, in that it appears as if they might have resulted from an accident by which, possibly, they became the models for the earthworks so exceedingly numerous in the interiors of Europe and North America. It would be going too far perhaps to assert, without qualification, that all the shell heaps antedate all the earth mounds, either temporally or culturally. At the same time, it would seem in accord with reason, and certainly not contrary to the accounts of early explorers, that, exclusive of limited groupings in the caves and natural recesses of the interior, the most primitive form of voluntary community life began, and was for a long time confined, largely to the shore margins of the continents. Here only could animal food be obtained in any quantity and literally bare-handed. The enforced community life may also be supposed to have furthered the division of labor necessary to the perfection of implements and weapons with which to conquer the interior. At any rate, permanent settlement or continued maintenance of life in the interior required, besides considerable knowledge respecting the utilization of vegetable products, a certain skill in the production and use of weapons such as only a long period of time and experience could supply.

It is possible that what the observed geographical distribution suggests may be disproved by a thorough examination of cultural

[22] Ranke, J., Der Mensch II, p. 553.

For a fuller bibliography of the Pacific Coast shellmounds see Vol. 7, No. 1, p. 6, of the present series.

and palaeontological remains. It is probable, moreover, that the designer of modern palaces may disdain tracing the origin of his art to any thing so lowly as even the most elaborate executions done in earth; although, for our purposes, it is essential to acknowledge every perceptible or possible step in both art and science. And, if in looking for the beginnings of architecture, we are permitted to pass beyond the rough masonry of the cliff-dwellers and the rude, often earth-covered, burial chambers of Megalithic times, to the earth mounds themselves, then perhaps we may proceed even so far as the shell heaps; for these accumulations appear in reality to represent the transition from what began as a mere accident and often ended in a structure with more or less definitely recognized purposes.

Turning to the shell heaps in the San Francisco Bay region, it is only by a wide stretch of the imagination that they can be considered "structures" in an architectural sense. They are thus at once to be distinguished from the pretentious earthworks of the Ohio Valley. Beyond the fact that the shell heaps under consideration were used for burial and domiciliary purposes, and were sometimes raised into more or less conical mounds, they show no evidence of consciously constructive design. There are no effigy mounds among them, as in Brazil;[23] nor are there any strong suggestions of defensive or ceremonial purposes about them, as in Australia.[24] At the same time these accumulations are not quite in the same class with the enormous shell heaps which, whether entirely artificial or not, are found in several places on the Atlantic shores of both North[25] and South America, where they often cover many acres to a depth of as much as twenty feet. From previous description it will be recognized that the San Francisco Bay shell heaps are comparatively small

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[23] See Reclus, The Earth and the Inhabitants, p. 108.

[24] Roth points out that the large and remarkably steep-sided shell heaps at the junction of the Iley and Embley rivers in Australia could readily be defended against attacking enemies and suggests further that the shell-and-ash composition probably afforded protection against fleas and other insects. *North Queensland Ethnography Bull.*, 3, p. 7.

Mound no. 256, east of Rodeo, is situated on a hillside directly above the entrance to a cave. This cavern, said to be forty feet long and of more than man's height, may well have served for protection against enemies but its chief importance was probably as a source of water supply.

[25] *e.g.*, Holmes, W. H., *Am. Anthropologist*, n. s., Vol. IX, p. 113.

in volume; but, judging from the nature of their composition and the probable slow rate of their accumulation, they may reasonably be considered fully as ancient as any known deposits elsewhere in America. They are kitchen middens, of the type found in Denmark, and have their counterpart in certain shell heaps in the Gulf and Atlantic Coast states, and in their general nature quite agree with the refuse heaps in the vicinity of Puget Sound on the northwest coast. From a strictly cultural standpoint the group may in a way be said to show wide affiliations along certain broad lines, but to be otherwise quite isolated.

COMPOSITION AND INTERNAL STRUCTURE.

The San Francisco Bay shell heaps contain, besides molluscan remains, a large percentage of ashes and charcoal, together with varying quantities of broken rock and waterworn pebbles. Occasionally there seems also to have been added more or less of ordinary earth or dirt, until in some of the mounds—and usually those farthest from the shore—the shells become an almost negligible element. The presence of the pebbles in some of the deposits is difficult to explain, unless they were brought with the earth; and this seems not always to have been the case because the pebbles are often most abundant in the accumulations containing little but shell and ashes. Furthermore, it is to be observed that some of the mounds containing the pebbles are situated on the marsh and in other places near which pebbles are not now to be obtained.

The cracked and broken rocks, which were supposedly brought together chiefly for hearth and cooking stones, vary in kind locally, but foreign specimens are everywhere present and some of these must have been brought long distances.

The internal structure of the mounds has been studied with some minuteness in three places, and has besides been observed in several other widely separated localities where either natural or artificial agencies have exposed the interior to view. To speak of definite structure in a promiscuous mixture of more or less broken shell and other matter may be unwarrantable; nevertheless, bedding planes or lines of deposition are often made visible by sudden changes in the shell species or may be inferred

from streaks of ashes running through the mass. In the Emeryville mound distinct strata are in fact produced by alternating depositions of raw and calcined shells. But this is an exceptional occurrence. The burnt shells and ashes, always most apparent in the upper lévels of the deposits, occur usually in streaks and sometimes in large pockets, mixed with rock, as if marking individual fireplaces. It is a noteworthy fact, however, that, unlike the shell heaps in the Aleutian Islands, these show unmistakable evidences of the use of fire from the very beginning Thus, while actual fireplaces are not readily detectable in the lower levels, charcoal is abundant at the bottoms of two thirty-foot mounds and has been brought up repeatedly from points twelve to eighteen feet below high tide level. In one of the mounds, however, a shade of doubt is cast on this point owing to the fact that the material at the bottom seems to have been disturbed or at any rate does not truly represent the center, *i.e.*, the oldest part of the accumulation.

In general, the vertical section of a mound begins at the top with a foot or two of somewhat finely disintegrated material; grows loose, coarse and distinct in structure for some distance; and, finally, the lower end of the column becomes a compact and practically homogeneous mass in which nearly all the shells are crushed. At first, such a condition seems perfectly natural. But the rule does not hold in all cases. That the disintegration at the surface is the normal result of weathering and vegetal processes need not be doubted; but the finely broken shells of the lower half or two-thirds of the pile do not represent a clear case of disintegration. It is true that the lower levels of the mounds in question are made up largely of mussel shells, the bits of which are somewhat softened and fragile, though they still retain their lustre; and it might be argued that the mere weight had crushed the mass and reduced it to its present consistency. However, there is a small admixture of clam and oyster shells, nearly always crushed to the same fineness as the mussels, but sometimes scattered about entirely unbroken. The clam and oyster fragments are still quite as firm as the shells of the present day; and if weight or disintegrating processes reduced some, why not all? Again, if the weight could crush the mussel shells in some of the

mounds, why not in the rest? It would seem that the lower, compact portions of some of the mounds were laid down under different conditions from those on the top. In two mounds the line dividing the finer and the coarser depositions is very sharp and distinct, but whether it represents a long interval of time or corresponds to a change of inhabitants is made clear neither by the remains of the higher animals nor by the cultural evidences.

MOLLUSCAN REMAINS.

Of the molluscan remains the "soft-shelled" clam, *Macoma nasuta,* and the "soft-shelled" mussel, *Mytilus edulis,* are common to all the mounds, and usually make up the bulk of the material. The only marked exception to this rule occurs in the mounds at Point Isabel, West Berkeley, Alameda, and San Mateo, where the oyster, *Ostrea lurida,*—practically absent in the sites bordering the extremities of the bay—is found in great quantities. Other species such as the large "hard-shelled" clam, *Tapes staminea;* the long "hard-shelled" mussel, *Mytilus californianus;* the cockle, *Cardium corbis;* the abalone, *Haliotis rufescens,* and three small univalves, *Purpura crispata, Cerithidea californica,* and *Acmaea patina* are only sparsely represented. Of these, the two first named univalves and the mussel may have had restricted habitats in the bay; while the clam, the cockle and the abalone were probably brought from the ocean shore.

Some changes appear to have affected the species and their habitats in the bay since the shellmound people arrived. The native oyster, for example, no longer breeds in the bay, except possibly off San Mateo; the "hard-shelled" mussel has been observed only on the ocean shore where the rough surf plays; and none of the univalves mentioned above have been noticed anywhere about the bay. A particular species of clam, *Mya arenaria* Linn., observed only in one mound, central in the region, seems now to thrive wonderfully in most parts of the bay. A new mussel, *Modiola* sp., is said to have been imported from the Atlantic Coast within historic times and samples of its shell have been found on the surface of one or two of the mounds. Oysters from the Atlantic Coast have been planted in the bay in recent times and these appear to thrive fully as well as any of the native

molluscs, though at the present time all of them are threatened by crude petroleum which escapes in the form of waste from the various oil-works located on the bay shore.

Of all the molluscs represented in the shellmounds only the common clam and mussel seem to have persisted since the middens began to accumulate; and these are still found in sufficient quantities in the bay to supply the markets of all the bordering cities. Certain mounds do nevertheless furnish indication of probable local changes in the preponderating species; and wherever these changes are marked, it is the mussel which is most abundant in the lower strata while the clam becomes suddenly quite excessive in the upper horizons. It is impossible to say whether these changes are due to biological or geological causes. Probably the rate of sedimentation has been a vital factor; in any case, the sinking of the region and the disappearance of rock-bound shores would have seriously affected the life of the mussel. It is interesting also in this connection to learn from the fishermen that the last twenty years have witnessed some very marked fluctuations both in the quantity and the habitat of the shellfish.

Following is a list of molluscs known to occur in the shellmounds:

Oyster, *Ostrea lurida.*
Mussels, *Mytilus edulis* and *M. californianus.*
Modiola, sp.
Soft-shelled clams, *Macoma nasuta* (and *M. edulis?*).
Myra arenaria.
Hard-shelled clams, *Tapes staminea* and *T. tenerrima.*
Cockle, *Cardium corbis.*
Abalone, *Haliotis rufescens.*
Purpura crispata and *P. caniculata.*
Cerithidea californica.
Olivella biplicata.
Acmea patina.
Standella, sp.
Land snails, *Helix*, two species.

VERTEBRATE FAUNA.

While the indicated change in the preponderating shell species is of no particular cultural significance, it is otherwise with the remains of the vertebrates represented. There are no sharp changes from invertebrates to vertebrates and from fishes to

mammals, such as Dall appeared to find in the Aleutian Island shell heaps. But progress is here. Mammalian bones seem to occur at all levels in some of the largest mounds; yet it is safe to say that more than ninety-five per cent., quantitatively measured, are confined to the upper six or eight feet. The doubt implied is again due to the uncertainty as to whether or not the excavations reached the oldest part of the mounds. But in any case, the occasional surprise or accidental capture in earliest times of big game, marine or terrestrial, counts little against the successful slaughter of a great variety of animals in later days.

Fishing may or may not have been an important industry. There happen to be very few fish bones in the mound material, although the grooved stones, usually held to have been net-sinkers, occur at all levels in some of the deposits. It is of course possible that fish may have been cured for consumption elsewhere.

Bird bones, apparently of ducks and waders, are rather numerous, especially in the upper strata. Their presence suggests two things: first, that at least the latest mound people lived on the bay shore during the winter time, when ducks were present; and, second, that these peoples possessed no domestic dog. The latter inference is based simply on the fact that no half savage, hungry dog would have left the bird bones in the condition in which they are often found.

The identified animal bones include the following species:

Deer, *Cervus*, sp.
Elk, *Cervus canadensis*.
Sea-otter, *Enhydra lutris*.[26]
Beaver, *Castor canadensis*.
Squirrel, *Spermophilus*, sp.
Rabbit, *Lepus*, sp.
Gopher, *Thomomys talpoides*.
Racoon, *Procyon lotor*.
Badger, *Taxidea*, sp.
Skunk, *Memphitis occidentalis*.
Wild cat, *Lynx*, sp.
Bear, *Ursus*, sp.
Dog, *Canis familiaris*.[27] (?)
Seal, *Phoca*, sp.
Sea-lion, *Zalophus californianus*. (?)
Porpoise, *Phocaena communis*.
Whale.
Canvasback Duck, *Aythya vallisneria*.
Goose. (?)
Cormorant, *Phlacocorax*, sp.
Waders, or some large birds.
Turtle.
Skates, Thornbacks, and other fish.
Wolf, *Canis*, sp.

[26] Otter must once have been plentiful in the region because, according to Spanish history, the skin was an object of trade for an indefinite period from the time of occupancy in 1769.

[27] The remains found, in one case at least, were doubtless those of a recent animal accidentally left on the mound.

CULTURE AND HISTORY OF THE SHELLMOUND PEOPLE.

MATERIAL CULTURE.

The augmenting capacity of the shellmound people, implied in a measure by their more and more successful hunting, is made sufficiently evident by a study of the artifacts. As with the animal bones, while some of the preserved suggestions of industrial life occur from the bottom of the accumulations to the top, they are after all relatively abundant only in the upper levels. But this fact would of itself prove little did not the implements of later times also show much greater variety and specialization as well as perfected workmanship. Viewing the culture as presented in its entirety however, the change or progress is not perhaps so clear and marked as might have been expected. These people, rude as they may have been, from the start employed fire; used prepared vegetable foods; satisfied their hunting instinct; and fished, supposedly with seine—if they ever fished at all. They also used body-paint and they buried their dead. In other words, they were from the beginning quite above the stage in which savage man may be supposed to have struggled for his mere existence alone. The later mound occupants may have brought, or, if they were direct descendants of the first inhabitants, may have originated activities along other fundamental lines; though the clear proof of such seems wanting. For instance, it is tolerably certain that skin-dressing and basketry were practiced in late times, but with our present knowledge it would be unsafe to say when these arts began or even that they did not arrive with the first appearance of the mound people. More evident seems the relatively recent development of certain luxurious habits and tastes such as are implied by the presence of pipes, musical devices and decorative objects. Finally, it may be well to add that there appears to be no form of artifact found at the bottom of the accumulations that does not also occur near the top.

The culture as observed, were one to describe it in terms of the present system of archaeological classification, is neolithic. Some roughly chipped flint and chert flakes were indeed found in the lower horizons of one of the shell heaps, but these pieces may

hardly be considered palaeolithic in the true sense. As would be expected, only such effects as are made of bone and stone and shell have resisted disintegration, and these remnants include weapons, household utensils, working tools, ornaments and possibly ceremonial objects. Such fundamental things as spear and arrow points, mortars and pestles, hammer stones and roughly grooved sinkers occur at all levels in many of the deposits; but the shapely and sometimes highly polished bone awls, the graceful "charm stones," the delicately worked stone pipes, the bone whistles, the stone labrets and certain shell beads and pendants, all appear to be confined to the upper horizons in at least some of the very largest mounds. The record, apparently so clear and simple, is nevertheless difficult to interpret with certainty, and even if it be accepted at face value, there still remains a legitimate doubt as to whether the cumulative nature of the culture is due to the natural development of a fixed population or is the result of substitution by conquest or migration.

Mention may be made of certain minor local variations in the culture of the mound group. Some of these changes may possibly correspond to the recently determined geographical limits of native linguistic stocks, but there are others of which this cannot be true. For example, the grooved sinker occurs in great abundance in some deposits; while in others, closely adjacent, it appears to be entirely absent. There has been found also in the northeastern part of the region a particular form of mortar—a large, roughly rectangular slab with a small bowl on the smoothed side—which has not been observed anywhere else, the usual mortar being either globose or bucket-shaped. Other differences are apparent, but they must await further investigation.

While, as previously observed, the study of shell heaps here and elsewhere does not yet warrant detailed culture comparisons on a world scale, some features at least seem to stand out pretty clearly. In the first place, this type of culture represents almost everywhere a relatively low stage and for that reason—the primitive needs being identical—shows several broad similarities, particularly in the nature of the pointed and sharp-edged types of implements. Thus the bone awl, the wedge, the flint flake, and even spear and arrow points differ comparatively little for the

entire world. All this seems natural enough because the piercing point and the cutting edge really embody fundamental requisites, such as are furnished by nature to many of man's competitors in the animal world.

Specialization is probably a question both of time and of ingenuity. For a long period it was doubtless held in check partly by the manner of occupation a given environment compelled and partly also by the nature of the raw material furnished by any particular geographical area. Consequently it may be assumed that real differentiation did not appear, on many lines, until individual imagination and taste were ripe enough for expression. But even the artistic instinct has asserted itself similarly over vast geographical areas, though doubtless many products apparently under this category may be the result either of trade or migration. As examples may be mentioned the "charm stones" and certain shell ornaments that are found on the Atlantic as well as on the Pacific shores of North America. In the second place, if we except Europe or those parts of the world thoroughly changed by Aryan or other acculturation, it may be stated with some degree of confidence that cultures of the various shellmound groups, in so far as they differ among themselves, usually agree with or shade into the civilization attained by the natives perhaps still occupying the respective regions.

Referring to the positive side, the culture of the San Francisco Bay shell heaps conforms, at least in its broader features, to that of the late Indians of the surrounding territory roughly designated as Middle California, somewhat as the attainments of the shellmound peoples on the Atlantic shores appear to have shaded into the civilization of the there native Red Man of historic times. Again, negatively considered, while pottery or evidence of work in clay is common to every one of the known shellmound groups in all the rest of the world, it is absent from the San Francisco Bay deposits precisely as it is in Central California ethnology. In conformity also to the same rule, no native-worked metals have been found here although such occur in many shell heaps, even in those so near as Puget Sound, where are also found certain entirely unique rock sculptures. It would appear, therefore, that so far as may be judged from the cultural evi-

dences above, no very definite conclusions can ever be reached regarding the origin of the shellmound peoples and their possible migrations. There remains, however, another means of determination, which may prove more fruitful, namely an examination of the skeletal material.

HUMAN REMAINS.

Fortunately the shellmound peoples everywhere it seems, except in Denmark, have interred their dead in the accumulated refuse on which they lived. It is certain at least that all the mounds of any size in the San Francisco Bay region contain numerous burials and the remains, even those beneath the sea-level, are often remarkably well preserved.

At the outset one is disposed to wonder at such a world-wide practice that really appears to have no precise explanation. The religious motive is sometimes assigned, and while there is no good ground for disputing such a view, especially as nearly all human actions appear to have had some religious significance at one time or another; still a thoroughly practical reason may not be entirely wanting. The shell deposits, it will be recognized, are made up usually of loose, porous material very easily dug into with a stick or a shell or even with the bare fingers; on the other hand, to make a hole large enough to accommodate a human body in ordinary California soil is a hard task at some seasons of the year, even with modern tools. However, this is merely suggestive, and primitive man may have had other reasons for burial of his dead in the mounds.

The mortuary customs cannot here be considered in full detail. It will be enough to state that the common practice from the start seems to have been interment rather than cremation, though occasional evidence of the latter has been observed. The particular disposition of the remains varies decidedly, sometimes even in the same mound. Occasionally the body has been laid out at full length with the face either up or down. At other times the arms and legs have been folded tightly against the trunk and the body laid face down. But as a rule the remains lie on the side with the limbs more or less flexed. Group burials of two or more are also not uncommon, the remains lying usually very

snugly, spoon fashion. No attention seems to have been paid to cardinal directions, as is popularly supposed; nor do there appear to be any interments in a sitting posture. The great majority of the remains are not accompanied by artifacts of any kind. Occasionally a male is fitted out with pipes and weapons, while a few females may be supplied with mortar and pestle and sometimes several awls. Children have invariably been accompanied by beads and trinkets made of sea shell. There is also reason for believing that food was placed with the body, pockets of unopened bivalves having on several occasions been found close to the remains.

No careful study has been made of the osteological remains as yet because it is hoped that additional material may be secured from at least a few more mounds. But to all appearances the shellmound peoples were of average build, with some amount of variation in skull form, but with no striking peculiarities.

ORIGIN OF THE PEOPLE.

The first questions naturally asked in connection with the study of these shell heaps concern either the age they represent or the people who made them. Were they the progenitors of the Indian or were they different? Enough has already been stated to make it clear that there is thus far no definite reply to either query. Speculation on such themes, perhaps indirectly fruitful, has long been fascinating pastime; but for even a tentative answer we must await a more thorough investigation of the facts relating not only to these shellmound people but to the prehistoric Americans as a whole.

So far as concerns the San Francisco Bay people, we have seen that there is no great gap either in the evolution of the culture as traced from the bottom of the accumulations to the top, or between the attainments of the last occupants and the culture of the Indian who inhabited Middle California less than a century ago. Moreover, as it is even certain that late Indians lived on some of the sites until a few decades ago, it becomes difficult to reject the opinion that the original migrants who began the refuse accumulations were of his own race, if not his direct ancestors. But it may be well to bear in mind that a

judgment based upon a culture so largely utilitarian is of doubtful value, and possibly a careful study of the skeletal material may lead to a different view.

AGE OF SETTLEMENTS.

A somewhat more definite statement may be ventured regarding the second question, namely as to the time elapsed since the shell heaps were begun. It is of course impossible to fix the absolute age of any of these repositories, but there are a number of things that indicate their relative antiquity. Such facts are for example the general absence of evidence suggesting European contact; the amount of wash or drift that has covered up some of the deposits; the fairly old trees that grow on the tops of two or three of the mounds (pl. 32, fig. 1); the amount of subsidence of the bay region which some of the deposits record, and the enormous volume of sediment which has been deposited in various regions of the bay, in part at least subsequent to the time when some of the largest refuse heaps were abandoned. Add to these the suggestion of the enormous volume of some of the deposits, and their great age, humanly speaking, must be apparent.

If one tries to estimate the duration in terms of years, a difficulty presents itself at once in that it is impossible to know whether the mound people shifted from one site to another, as Darwin observed in Patagonia, or whether they even lived on the bay shore at all seasons of the year. It has been suggested in connection with the presence of bird bones in the deposits that the occupants lived by the water during the winter, but there is no proof that they followed the recent custom of retiring to the hills during the summer. If territorial boundaries were respected in those days as in later times, then, in view of the fact that the immediately surrounding hills are not altogether favorable as summer retreats, it may be assumed, for our purposes, that the mound people remained practically stationary and drew a varying quantity of molluscs from the bay the year round.

For something more satisfactory than a guess let us estimate the age of one of these accumulations on the basis of the probable daily amount of deposition. Mound no. 295, at Ellis Landing, near Richmond (pl. 33, fig. 2), which has a volume approximating

1,260,000 cubic feet, may be used for this purpose. There were on the top of this pile about fifteen house pits, and if we allow an average of six persons to the family or house we may assume a community of ninety or one hundred individuals of mixed age. It has already been pointed out that these people hunted the higher animals and utilized vegetable products, so that they were never entirely dependent on the molluscs. Suppose, however, that in the earliest times, when only the mussel was abundant, they gathered a daily average of fifty shell fish per person, which would of course leave considerably more than fifty for each mature individual and an amount that, supplemented as it was by other things, would probably be sufficient. Actual trial shows that the volume yielded by the total 5,000 shells, crushed down to their present consistency, would be about 1,200 cubic inches. To this amount should be added a quantity of ashes, broken rock and such extra debris as may collect about a camp—possibly sufficient to make up one cubic foot for the daily average. Calculated on this basis it would apparently have required about 3,500 years to accumulate the pile. Even though one may refuse to take these figures at anything like face value, if we consider that the site was possibly not occupied for several centuries, and that it may never have served as permanent residence, it becomes reasonable still to believe that the mound is anywhere from three to four thousand years old.[28]

THE IMPLIED POPULATION.

In view of the astonishment commonly expressed with reference to the great number of shell heaps in the San Francisco Bay group, it may not be out of place in closing to remark briefly on the probable aboriginal population. There are insuperable difficulties in the way of arriving at even an approximately satisfactory answer to the question, and this would still be the case were the original number of mounds present. In the first place, it may safely be assumed that the shell heaps were not all begun at the same time; and, in the second place, it is practically certain

[28] Dall estimates 3,000 years as necessary for the accumulation of some of the Aleutian Island mounds, and the age of some of the kitchen middens in Denmark has been placed at 3,500 years.

that some of the very largest mounds were abandoned long before others. The Spaniards explored the bay region quite thoroughly in the year 1775, and they appear not to have observed Indians living on the larger shellmounds near the shore unless possibly on mound no. 3, at Sausalito, and at Crockett, on the south side of Carquinez Strait;[29] but many informants have pointed out both some of the smaller sites between San Rafael and Petaluma and also some of the larger ones south of San Mateo as having been occupied by the Indians as late as 1870. Precisely how far the buried culture may substantiate these statements remains to be proved. On the one hand, no sign of European influence has so far been encountered in the three large mounds systematically investigated; but, on the other hand, reports are current, mostly referring to long past discoveries, in several of the mounds, that would suggest at least indirect contact with higher civilization. These reported finds include such things as "brick, of Spanish make," from mound no. 3 at Sausalito; "red silk," supposedly from one of the San Pablo mounds[30]; and from no. 232, on Mare Island, even a stone slab, said to have been inscribed with "Egyptian hieroglyphics"; but the only recent and seemingly well authenticated find, coming from near the surface of no. 316, the large Alameda mound previously mentioned, is a small brass medal bearing the date of 1768.[31]

It appears therefore quite impossible to say how many of the middens were occupied at any one time. Nevertheless, if we allow that some of the older mounds have been submerged or obliterated

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[29] The report of Portolá's first overland expedition from San Diego to San Francisco Bay, in 1769, says that they judged from the numerous columns of smoke observed that the country about the south end of the bay was well stocked with Indian villages. The party saw and had dealings with the Indians while encamped on San Francisquito Creek. Later, in 1775, Commander Ayala of the *San Carlos*, met or saw natives at two points on the present site of San Francisco and also in the vicinity of Sausalito, where, according to recent hearsay evidence, a populous Indian village existed subsequent to 1838. Cañizares expressly states in his reconnaissance report that he made four visits to an Indian rancheria on the south bank of Carquinez Strait, near the west end, and that he counted there about 400 souls. See *The March of Portolá*, pp. 39-68.

[31] A fragment of a rectangular, three-legged metate like those common to Middle America was also found in or upon one of the mounds at West Berkeley.

[30] Southall, J. C., Recent Origin of Man, p. 550.

and that others have been started in later times to take their places, it is probable that the present number, about four hundred, is not so very far out of the way. If we may then judge at all from the number of house pits found on some of the mounds, the group as a whole may easily average, say five houses to the mound; and estimating six individuals to each house or family we get a population of twelve thousand. Such a figure may seem a little startling at first, because every observer will recognize that the territory in question could not support such a population at the present time. Still there seems to be no inherent reason why under former natural conditions a perfect utilization of all the resources should not have maintained from ten to twenty thousand individuals of mixed age. The figure at all events is not so extraordinary in view of the fact that the estimated total of the aboriginal population for the entire state of California has recently been set by Dr. C. H. Merriam at about two hundred and sixty thousand.[32]

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[32] *Amer. Anthropologist* (n. s.), Vol. VII, No. 4, p. 594.

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EXPLANATION OF PLATE 32.

Fig. 1.—Mound no. 75, situated at the edge of the marsh in the mouth of a small side canyon, on the north side of Ross Valley. The mound adjoins a peculiar isolated rock outcrop. Diameter of mound 100×150 ft. through the base; height about 15 ft. View looking north.

Fig. 2.—Mound no. 10, situated on the highland edge of the marsh, below Mill Valley. Dimensions 200×450 ft. through the base; height 20 ft. Diameter of the truncated top 90 ft. View looking southeast.

Fig. 1.

Fig. 2.

EXPLANATION OF PLATE 33.

Fig. 1.—Mound no. 271, situated on the south bank of San Pablo Creek. Dimensions 240×300 ft.; height about 12 ft.; total depth of the shell over 20 ft. The mound has been cultivated for more than fifty years. View looking east.

Fig. 2.—Mound no. 295, situated on the shore edge of the marsh at Ellis Landing, near Richmond. Dimensions 245×460 ft.; height prior to excavation 17 ft.; base of the mound is 11-18 ft. below sea level. View looking southeast across the marsh and bay at flood tide.

Fig. 1.

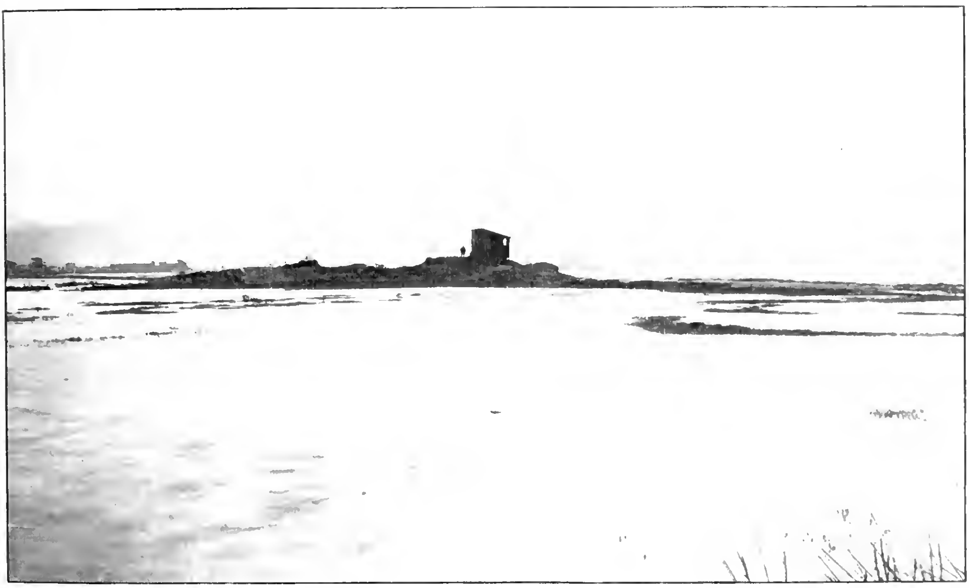

Fig. 2.

EXPLANATION OF PLATE 34.

Fig. 1.—Mound no. 283, situated at Chinese Camp, on the west side of Potrero San Pablo. The deposit lies on a clay slope 7-8 ft. higher than the beach. Present dimensions about 150×200 ft.; height 9 ft. The seaward extension of the mound may possibly lie buried in the tide flat off shore. View looking northwest.

Fig. 2.—Mound no. 290, situated on the shore near the northwestern extremity of Brooks Island. The deposit lies on a slope consisting partly of solid rock, and extends 15 ft. below high tide level. The visible portion extends 210 ft. along the beach and rises 12 ft. above the beach level. View looking southeast.

Fig. 1.

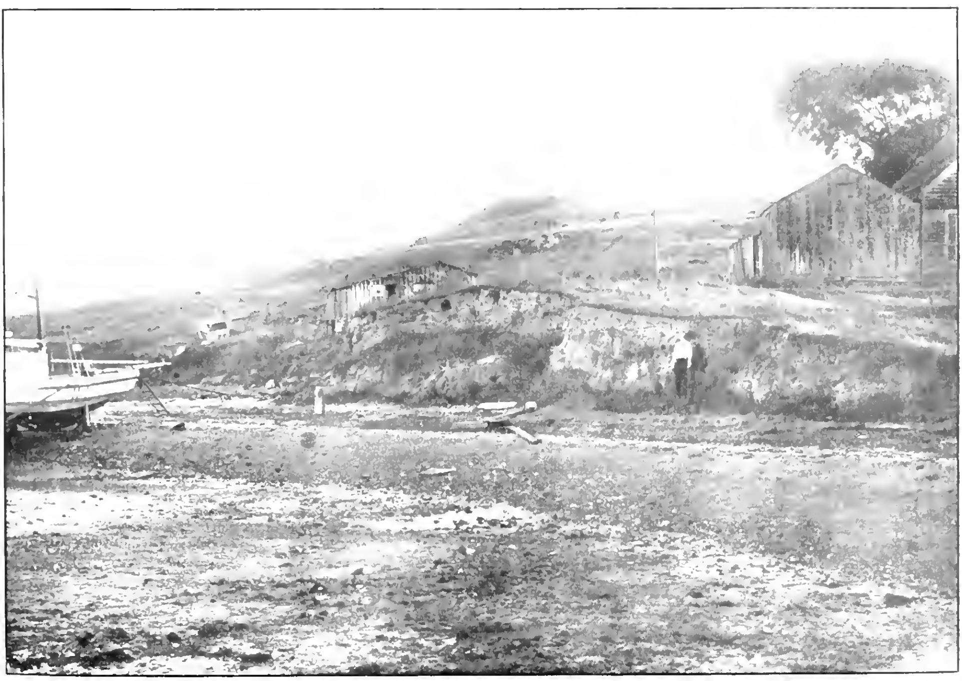

Fig. 2.

EXPLANATION OF PLATE 35.

Fig. 1.—Mound no. 372, situated at the marsh edge, corner of Poplar avenue and H street, San Mateo. Dimensions 150×225 ft. through the base; height may have been as much as 12-15 ft. Made up largely of oyster shells. Shells now being screened and put to various uses. View looking northeast.

Fig. 2.—Illustration of a large sand dune rising about 20 ft. out of the reclaimed tule lands near the western extremity of Bradford Island. This island is encircled by various channels of the San Joaquin River a short distance east of the point where this river joins with the Sacramento, to enter Suisun Bay. Prior to reclamation, the lowlands, which are composed almost entirely of solid peat up to 50 ft. in depth, were continually flooded; but nearly all of these peculiar eminences appear to have been occupied by the aborigines. View looking south.

Fig. 1.

Fig. 2.

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THE ELLIS LANDING SHELLMOUND

BY

N. C. NELSON

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INTRODUCTION.

Of more than four hundred artificial shell deposits known in the San Francisco Bay region, perhaps none is of more general scientific interest than the large accumulation at Ellis Landing, near Richmond. This mound, besides being a conspicuous archaeological feature, furnishes incontestable evidence of having survived a considerable subsidence of the bay country which occurred subsequent to the arrival of primitive man, and has for these reasons been singled out for special investigation by the Department of Anthropology of the University of California.

The opportunity for systematic work on an extensive scale did not present itself until the summer of 1906. Previous to that time, during a period extending over several years, the University Museum had acquired by gift and by purchase a fairly representative collection of artifacts, numbering about two hundred and fifty specimens. While generally representative of the given culture, the value of this collection lay chiefly in the

added incentive it gave for a careful examination of the mound.

In August, 1906, at the request of Professor John C. Merriam, the writer, assisted by Mr. A. W. Wepfer, excavated a radial trench in the Ellis Landing shellmound. The work here was carried on continuously for four weeks, and was completed by the writer in December of the same year. The results obtained seemed sufficient for a preliminary report; and no further work was in immediate contemplation, when a fortunate circumstance arose. A portion of the mound material was sold for grading purposes; and in July and August, 1907, during the removal of the deposit, the writer was present to collect what artifacts and skeletal remains were uncovered. The archaeological data then at hand were deemed all that it was practicable to obtain, under the circumstances, as the remaining uninvestigated horizons of the mound were below sea-level. But, in order to round out the work, several additional weeks were given to a study of the geological factors concerned in the mound's history. This involved, besides some general observations on the local physiography, a determination of the nature and depth of the foundation of the mound, as well as the lateral extent of the deposit, and the grade of the submerged slope. Finally, in February, 1908, at the suggestion of Professor Merriam, the writer sank a shaft to the bottom of the mound in order to obtain some clue to the culture conditions represented in the strata below sea-level.

The work on the Ellis mound is a part of the regular investigation of the problem of prehistoric man in California carried on by the Department of Anthropology through the generosity of Mrs. Phoebe A. Hearst. It has been done under the immediate direction of Professor John C. Merriam, to whose counsel and encouragement what of permanent value the results may possess will be largely due. To Mr. George Ellis of Richmond thanks are due, not only for repeated permission to cull the mound, always generously extended, but also for assistance rendered and unvaried courtesy. Acknowledgment is made also for assistance and suggestions received from Professors A. L. Kroeber, R. S. Holway, A. C. Lawson, and Mr. H. O. Wood of the faculty; and to Dr. Harold W. Fairbanks and others not connected with the University.

THE MOUND IN RELATION TO ITS PHYSICAL ENVIRONMENT.

GEOGRAPHIC LOCATION.

The Ellis Landing shellmound is situated on the northeastern shore of San Francisco Bay proper, directly north of Brooks Island[1] (pl. 36). The marsh, fringing the greater portion of the bay shore, is here only six hundred yards wide; and on the shore edge of this rapidly eroding belt lies the mound, itself now more than half destroyed by wave action. The situation is peculiar and has given rise to several interesting but unfounded popular theories. The site in no way conforms to the general conditions observed now in more than four hundred instances, as there is neither fresh water nor firewood, excepting driftwood, anywhere within miles. In summer the locality is exposed to very strong southerly winds rushing to the hot interior valleys; and only in the dry season, if at any time of the year, is the mound quite approachable except by boat or artificial bridging. These facts collectively serve as sufficient occasion for a consideration of the history of the region.

TOPOGRAPHY OF THE REGION.

To the casual observer who visits the mound-site, the region appears as a broad valley, cut short at both ends by the bay waters, but in width stretching from the Berkeley Hills on the east to a range of hills about three and a half miles to the west. The western range, known as the Potrero San Pablo, is a narrow six-mile stretch of hills rising suddenly about half a mile west of Ellis Landing and extending in a northwest-southeasterly direction, parallel to the general trend of the Mt. Hamilton Range on the east and the Tiburon Peninsula on the west. Brooks Island is geologically a part of this range, and was probably connected with it until within comparatively recent times.

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[1] Cf. the San Francisco Quadrangle (California) of the Topographic Map of the United States, by the United States Geological Survey, on which the mound-site may be located at the intersection of 37° 55′ N. latitude and 122° 21′ 30″ W. longitude. Twelfth Street of the city of Richmond, if extended across the marsh, would also intersect the mound.

On the north the so-called valley opens almost squarely with its whole width on San Pablo Bay; to the south it fronts on San Francisco Bay, the distance between the two bodies of water averaging four miles and a half. The whole region constitutes a plain about sixteen or seventeen square miles in area. This plain is treeless, except along the creeks crossing the northern end. It is quite flat, the only irregularities being two hillocks which rise abruptly from the flat surface. One of these, Cerrito, a small, round knoll, lies in the south-central portion of the plain, above the general level of which it rises 140 feet; and the other, a much smaller outcrop, is located slightly south of the east-central part of the tract, less than half a mile from the base of the Berkeley Hills.

About one-third of the flat is tide land or salicornia marsh, which is wedged into the tract from both the north and the south along its western side, and separates the remainder of the plain from the abrupt slope of the Potrero Hills. Until recently a narrow belt of the wet land stretched the entire distance across the north end of the plain, separating the dry land from San Pablo Bay; but on the south, at Stege, there has been, as far back as any one remembers, a gap in the marsh belt made by a small tongue of the upland which fronts the bay waters with a six to eight-foot bluff.

The remaining dry land portion of the tract has now the rough outline of an isosceles triangle, with its six-mile base along the Berkeley Hills and its apex at the Santa Fe yards in the west end of Richmond, the marsh being here less than a fourth of a mile wide, and at present made habitable.

The general surface character of the triangle is that of a delta; and the larger portion of it has the characteristic shape and curvature of a crescent fan. The easiest grade on the fan, 125 feet in three and one-half miles, is that from the apex of the triangle to a point a little south of the center of the base. Immediately north of this point, on a slightly lower plane, Wildcat Creek emerges from the Berkeley Hills. From this stream the steepest descent runs northward for half a mile to the point at which San Pablo Creek leaves the hills at a level fully fifty feet below that of Wildcat. These two creeks, both well north

in the tract, after some meanderings westward, across a relatively low and level plain, finally unite at the perimeter of the dry land and empty through the marsh into San Pablo Bay. The low, level form of the northern part of the delta-like formation is probably not due to any process of degradation; for while both streams, owing doubtless to the artificial restriction of the water flow in recent years, have cut channels twenty to twenty-five feet deep in the alluvium, their banks are generally higher than the flanking plain. This fact would seem to warrant the inference that formerly, under normal conditions, the streams overflowed their banks occasionally during the winter freshets, and that they perhaps had very shallow beds and meandered irregularly over the plain.

The remaining larger portion of the upland tract to the south of Wildcat Creek is not drained by anything that can strictly be termed a stream, and does not seem very productive. There are some very slight superficial indications of old creeks that once crossed the area. One or two of these run between Stege and the Berkeley Hills, another skirts the east base of the Cerrito, and a third seems to have crossed the plain somewhere half-way between Cerrito and the city of Richmond, passing in all probability close by the Ellis Landing mound on its way to San Francisco Bay.

GEOLOGIC FEATURES OF THE REGION.

Depth of the Alluvial Formation.—From the records of wells driven on the flats east of Richmond it is seen that the alluvium contains a number of irregularly radiating streaks of water-bearing gravels ranging in different places from three feet to several hundred feet below the surface. Of late years, it appears that many of the shallow wells on the flat have gone dry, owing probably to the fact that both the Standard Oil Company and the People's Water Company have driven a large number of wells in various places on the tract.

Three well-borers testify independently to these general facts; and one of them, Mr. Boorman, who has driven wells in the neighborhood since the late fifties, says that for an extra good flow of water he has been in the habit of boring from seventy to

one hundred feet on the higher portion of the flat, near the town of San Pablo; but that on the lower margin, as for example in the southwestern part of Richmond, he has been obliged always to go down 250 to 260 feet; and in places he has bored 170 feet without getting water at all. One fact worth mentioning was the statement made by Mr. Boorman, that in drilling along the southwestern margin he usually found a layer of sea-shells at about one hundred and fifty feet below the surface.

In addition to this general information, accurate data were obtained relative to a number of deep wells recently bored by the People's Water Company. This company has several groups of wells at different places on the flat, and the increasing demand for water makes it necessary to add continually to the number. Thus three or four wells have lately been driven in the old town of San Pablo, close to the south bank of the San Pablo Creek. The wells are practically in the mouth of the San Pablo Cañon, and very close to part of the old formation constituting the Berkeley Hills. Nevertheless, these borings are from 150 to 170 feet deep and end in cemented clay and gravel.

The most interesting series of wells is situated near San Pablo about one mile out on the flood-plain. Here, beginning near the north bank of San Pablo Creek, fourteen wells are arranged in two straight lines running northward for half a mile immediately west of and roughly parallel to the Southern Pacific railway. The surface grade runs from sixteen to twenty-four feet above sea-level, the highest point being nearest the creek. The two lines of wells are 480 feet apart and the seven wells in each line are also separated by the same distance. Seven of these borings have been completed and elaborate records, together with samples of the various strata perforated, are available.

The southernmost of these wells, next the creek, is 412 feet deep and strikes solid bed-rock at 375 feet below sea-level. The general result, obtained by plotting the entire series of borings, is that the surface of the old underlying formation slopes westward at from ten to twenty-five feet in 480 feet horizontal, and that the slope of the same surface northward for half a mile averages twenty-seven feet to every 480 feet horizontal, the grade in one place being actually as much as fifty feet to the 480 foot

unit. As the samples indicate, the water-bearing beds, nearly five hundred feet in thickness, are clearly enough of alluvial origin.[2]

There can therefore be no doubt that the whole tract in question is a recent fill and that the outcropping hillocks mentioned belong to an earlier topography. The accumulation of the delta material may have been greatly aided by the position of the Potrero San Pablo, which lies at an angle to the main axis of the bay, ready to catch not only the scourings from the Wildcat and San Pablo cañons but also much of the silt poured through Carquinez Strait into San Pablo Bay.

Activity of Erosion.—As to the signs of erosion of the older formations, it may be observed that a large portion of the western shore of the Potrero San Pablo is characterized by uniformly high and steep cliffs; while the east side of the range slopes gradually to the marsh level, except for the last mile or so at the north end, where, as in the continuation of the formation across the San Pablo Strait, the shore line is likewise high and steep. One possible inference from this fact is that the steep cliffs have been worn on both sides of the range, where well exposed, since the last sinking movement. It may be suggested, furthermore, that Brooks Island to the south was probably insulated in the same way, the channel now separating it from the Potrero Range being only six to eight feet deep at lowest tide. But subsidence alone might account for the island, as one of the shellmounds situated here, partly on solid rock, has part of its foundation fully fifteen feet below ordinary high tide.

Subsidence and its Effects.—Whatever may or may not be accounted for by erosion, it is evident that some of the most striking features of this region are directly traceable to comparatively recent subsidence, as has been shown by competent investigators. The investigations conducted at Ellis Landing seem to contribute two facts to the evidence of subsidence available from purely physiographic studies, *viz.*: that at least a part of the movement, certainly not less than eighteen feet, has taken place

[2] The writer is personally indebted to one of the Water Company's engineers, Mr. Frank T. Oakley, for the data on which the conclusions are based.

since the advent of a race of people with a tolerably advanced type of culture; and that the movement itself was neither one sudden drop nor yet a single slow but continuous process.

At the present time such observations as can be made seem to show that the coast line is still advancing landward in the Richmond district. On the north, San Pablo Bay has advanced in places through the marsh fringe and has only recently removed the last remnants of a shellmound once well back on the dry land. But, on the whole, the process here is insignificant. On the south, however, erosion is more general and rapid. At present the whole stretch of shore from Ellis Landing to Stege, a distance of more than two miles, may be seen to move forward from year to year. Mr. Ellis, who has lived at the Landing about forty years, states that as late as twenty years ago the shellmound which is described in this paper was not only intact, but was actually protected by a strip of marsh thirty to forty feet wide. At that time it was considered too much trouble to wheel mound material across the marsh to a barge on the shore, and Mr. Ellis's father preferred to run a small canal from one of the marsh creeks up close to the mound on its land side.[3] At the present time, as may be seen on plate 48, the shore line has advanced 160 feet on the mound itself. The total distance eroded in approximately twenty years is therefore 200 feet, or an average of ten feet a year, which amount tallies almost exactly with the observed wear during the past three winters. But these figures should not be taken too strictly, for while erosion goes on all along the line from Ellis Landing to Stege, the rate is probably quite unequal.

The reason for the very rapid advance of the shore line cannot be definitely stated, but a suggestion may be ventured. At lowest tide one may walk over the rather firm tide flat for more than half a mile south from the mound, *i.e.*, about half-way to Brooks Island.[4] The bottom, which is about three feet below the marsh level near the shore, slopes only three and one-half feet to this half-mile point and then drops suddenly some six feet. It seems

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[3] Surveyors also claim that a line was once run on the marsh some 250 feet outside the present beach.

[4] Persisting hearsay evidence has it that in early historic days it was possible to walk from Stege to Brooks Island dry-shod at low tide.

to the writer entirely probable that the Richmond marsh once reached south almost to this sudden drop, if not farther; and that the cause of the rapid removal of the marsh may be the recently made gap between Point Potrero and Brooks Island. At any rate, but for the presence of this channel, the waters off the Ellis mound would be comparatively quiet and a silting process would probably be in progress. The present tide-flat is, however, the result, not of recent deposition but of recent erosion. And the time required for the removal of the half-mile of marsh surface would, at the present rate of cutting, approximate 260 years. Whether this reversal, from deposition to erosion, is due to the insulation of Brooks Island by either erosion or subsidence or both, the writer must leave for others to determine. Enough has been stated to show that the bay region has experienced a complicated bit of history since human beings entered upon the scene.

Recent Deposition.—While erosion has been in process on the outskirts of the marsh in very recent times, silting and deposition have taken place in the protected central region. The old settlers around San Pablo speak of a large lagoon that occupied the region west of the town, between San Pablo and Wildcat creeks, for a long time after their arrival in the early fifties. At times the creeks flooded the whole region about the old Spanish town, and on one or two occasions the ranchers were forced to seek refuge on a shellmound situated on the bank of the upper stream. Other hearsay evidence, but from seemingly good sources, is to the effect that there was not long ago an open channel or tidal race along the east base of the Potrero Hills, connecting San Pablo Bay with San Francisco Bay proper. It is stated that the channel was navigable for scows as late as fifteen years ago, and it is vouched for definitely that in 1862 a steamer "large enough to go to China" went through. However, the silting up of this channel was no doubt hastened by artificial means.

SITUATION OF THE MOUND WITH RESPECT TO RECENT GEOLOGIC CHANGES.

The position of the mound itself may once more be given as on the submerged southwestern perimeter of the San Pablo-Wild-

cat fan.[5] It is imbedded in an average of about thirteen feet of fine silt, but rests on a firm gravel foundation.

Several weeks, succeeding the time spent on actual excavation, were given to probing around and through the mound, at the points indicated on plate 48. For this purpose a strong two-inch pipe, cut into suitable sections, was used. The sections were provided with a half-inch slit on one side so that the pipe afforded a complete view of the material penetrated. Measurements and samples could also be taken at any place on the column.

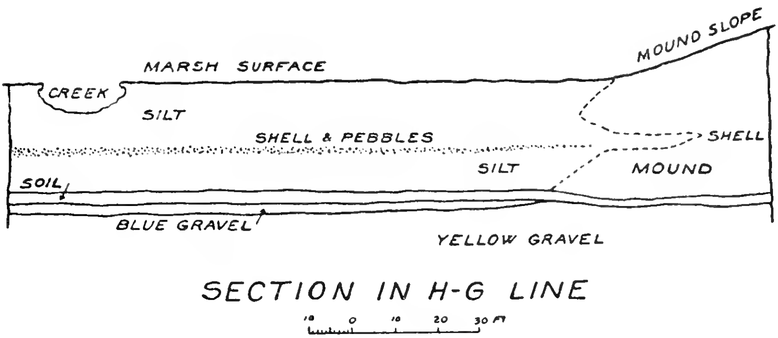

Fig. 1.

Fifty-five of these probings were registered and duplicated—in cases of doubt, several times. The result was the establishment of a practically even plane underlying the mound and its immediate vicinity, with, however, a perceptible tilt seaward and a sudden drop on the lower side, immediately beyond the mound base, along a northwest-southeasterly line. The approximate basal perimeter of the mound was also marked out, and the slope of the submerged portion determined in several places.

Considerable interest attaches to the peripheral mound slopes. Much time and care was given to determining with exactness the nature and extent of the peculiar silt wedges that are seen to enter the mound material at the extremities of the A-B section shown in plate 49, fig. 2. The accompanying figure illustrates

[5] As may be observed on the map, the Ellis mound is only one of twelve or thirteen deposits situated on the delta, partly in the north where the streams now are, and partly along the south border where streams were formerly. There are in addition sixteen shell deposits on the Potrero San Pablo and four on Brooks Island.

the same phenomenon in the section taken at the H-G line on plate 48.

It seems to the writer that the fine silt or mud which surrounds and covers the mound to a depth ranging from eleven to sixteen feet could not have been deposited except in quiet waters —waters too quiet, in fact, to disperse the shell deposit itself. At the same time, the deposition would seem to have taken place in water of some depth and not as at present, during periodical inundations of the marsh; because the silt in the immediate vicinity of the refuse heap contains only faint traces of vegetable matter below the upper two feet, except a stratum of peat, more than nine feet thick, which is encountered at a depth of ten feet on the seaward side of the mound. Furthermore, the carefully ascertained oblique slope of the upper face of the silt wedge would seem to indicate that the deposition of silt and mound material was for a time simultaneous. It is possible, of course, that the shell deposition at this level was not artificial, although observation of conditions at the present surface does not show that the mound is weathering or degrading to any appreciable degree; furthermore, the silt wedge does not extend around the entire mound.

Another unexplained feature is the thin streak of shell and fine pebbles which extends in a horizontal plane as much as three hundred feet away from the mound in all directions. It would seem as if, when the plane of the silt deposition was at the level of the apex of the wedge, there had been some unusual disturbance such as was never repeated.

As to the foundation itself, where examined, it is generally composed of medium coarse, yellow gravel. In some places about a foot of dark, sticky material intervenes between the gravel and the mound deposit, these patches being evidently soil or material made up of finer drift which had been covered with vegetation. It therefore appears that the mound was begun on dry land that had been above sea-level for a considerable period of time. In many places, however, the shell appears to rest directly on the gravel; and this, near the perimeter on the sea side, becomes blue or bluish green in color and is mixed with a good deal of sand.[6]

[6] For a broader treatment of the physiography of the San Francisco Bay region as a whole and its relation to shellmounds and shellmound culture, see the author's paper entitled Shellmounds of the San Francisco Bay Region, *Univ. Calif. Publ. Am. Arch. Ethn.*, Vol. 7, pp. 312-318.

THE MOUND AS AN ARCHAEOLOGIC FEATURE.

GENERAL DESCRIPTION.

Difficult of access, the Ellis Landing shellmound was never cultivated, as is usually the case with these fertile deposits; but, being overgrown with low bushes, *Baccharis Douglasii,* it has been for years through the shooting season a rendezvous for duck-hunters. On a stormy winter's day, at high tide, the mound may be seen at times a lonely island, completely surrounded by water which attains a depth of fully two feet on the marsh behind it (see pl. 37, fig. 1). At such times, in the past few years, the destruction of the mound went on at an extraordinary rate, the steep sea-wall caving and sliding as fast as the surf could remove and undermine. The waters in motion were able to suspend most of the fine material, which was worked off to both sides and rolled in over the marsh, making a bar on the east side about four hundred feet long and to the west another bar measuring a hundred and fifty feet in length. These extensions average thirty feet in width and a little over two feet in depth (see pl. 38, fig. 2). The two bars, together with the mound which separates them, afford a straight and smooth beach 850 feet long,—the only beach for miles around on which one can walk with comfort and convenience. On this beach the material heavier than shell (which constitutes the main portion of the deposit) grades off according to size and weight in either direction from the mound, only the finest pebbles and shell fragments being carried to the extremities of the bars; and here at low tide, one need not look long in vain for either artifacts or skeletal material.

Size.—As shown on plate 48, the portion of the mound actually visible has a roughly triangular outline. Considering the straight three hundred-foot shore side as the base, the perpendicular distance to the apex on the north or land side is 170 feet. The other two sides of the triangle are of unequal length, and curve, one outward and the other inward, from the hypothetically straight lines.

The greatest height of the mound above the marsh level was seventeen feet, and the greatest depth below the same level

(obtained out on the tide flat) is nearly sixteen feet; but the actual vertical distance from the highest point on the mound, as found in 1906, to the bottom immediately below was approximately 28 feet and 6 inches. The slope and contour, as indicated on plate 48, were fairly even, with the exception of the summit, which was dotted with a number of saucer-like depressions. Some of these measured as much as twelve feet in diameter and slightly over two feet in depth. They were probably old house-pits.

In addition to the natural processes which are at work, and which are certain to accomplish the mound's destruction in the near future, the accumulation has also been subject to artificial disturbance, and much of the material has been taken away for filling and grading around the Landing. As has already been stated, it was found most convenient to remove this ballast by way of an artificial canal run over to the edge of the mound from one of the marsh creeks (see pl. 38, fig. 1); and after more than forty years of this work, there is now, on this edge of the mound, an oval excavation measuring 70 by 100 feet (see pl. 48, and also pl. 38, fig. 1). This cavity runs back almost to the highest portion of the mound, and is excavated down practically to the marsh level. Out of it came many skeletons and artifacts, most of which are now scattered among individual curio-collectors.

The preceding description, it should be noted, refers to the mound as it appeared in 1906. The mound as it was before subsidence may be determined approximately from the data given on plates 48 and 49.

In order to obtain the mound's outline with reasonable accuracy, a straight east-and-west line was laid off on the beach, and a point in it least liable to disturbance was chosen as zero. This zero, located at the intersection with the A-B section, was used as a reference point throughout the work of 1907, both for locating specimens and for plotting the mound. The latter was accomplished by staking out, with the beach line as a base, two rectangles about the respective sea and land portions of the mound, the perimeter of which was then determined by measurements taken at every twenty-five-foot interval. On the sea portion of the mound this work had to be done during the intervals of low tide, and here permanent stakes were set to mark the surface

perimeter and also the two-, the four-, and the six-foot depths of the shell. Beyond the six-foot depth it was not practicable to determine the mound slope except by special probing at greater intervals, as indicated, for example, by the short K-L and M-N sections on plate 48. Similar work was done to determine the mound slope under the marsh proper, and the result is a tolerably accurate basal perimeter.

The submerged portion of the mound slope is smooth and fairly uniform except along the northeast and southwest borders, where occur the peculiar wedges already considered. Oblong in form, with a regular curve on the east side, and the extraordinarily sharp indentation on the west side, the deposit gives the impression of having been started from two centers. This conclusion, perhaps of no vital significance, is based partly on the fact that it is not uncommon in the bay region to find even as many as four mounds joined together along some creek bank.

The extreme northwest-southeast length of the mound measured at the base is 460 feet and the width averages 245 feet. With a probable height of about thirty feet along the summit ridge, the volume is calculated to have been approximately 1,260,000 cubic feet. Of this volume only about 490,000 cubic feet cropped out of the marsh, and of that portion again less than half was left in 1906.

Age.—The length of time required for the accumulation of such a large volume of refuse has been considered by the writer in a recently published paper[7] on the general distribution of shellmounds in the bay region, and it is hardly necessary to repeat here either argument or calculation. The estimate, which was made on a volume basis, places the age of the Ellis mound at approximately 3,500 years,—a figure which, as previously observed, accords closely with independent calculations made on similar deposits found in Denmark and in the Aleutian Islands.

THE EXCAVATIONS.

Trench.—The first excavation consisted of a trench carried from the highest portion of the mound out to the marsh edge (see pl. 48). The line selected followed the old Ellis excavation

[7] See *op. cit.*, p. 345.

as closely as possible in order to facilitate the disposal of the dirt, which after examination was easily thrown over into this hollow. The trench measured 108 feet in length and six feet in width. It was carried down for the most part as far as the ground waters permitted, *i.e.*, to about six inches below the marsh level, the exception being simply a narrow ledge left for staging purposes along a portion of the western wall in the deeper part of the cut. The opposite wall was kept straight and perpendicular, and its special and characteristic features were charted as the work progressed (see pl. 49, fig 1). All objects uncovered were located by two horizontal measurements referable to a fixed point at the end of this wall near the center of the mound; and by a third, vertical measurement, taken on the wall itself, opposite each particular object.

The volume handled approximated 5,500 cubic feet, and the total number of determinable artifacts obtained was seventy-eight, with many more of doubtful character. Besides a large quantity of animal bones, sixteen human skeletons were uncovered, most of them complete and in comparatively good condition. The positions of the latter are specifically indicated on plate 49, figure 1, and the characteristic methods of disposal are illustrated on plate 50, figure 1.

Mound Removal of 1907.—The removal of a large part of the mound for grading purposes in 1907 afforded a most excellent opportunity for further study at comparatively slight expense. As shown on plate 48, the portion removed took in a rectangular section on the seaward side, measuring about 60 by 160 feet. With three to four teams of horses moving about within these limits, the archaeological work was necessarily done at some disadvantage. All possible care was taken, but expeditious work was sometimes the first essential. The only practical way to obtain location figures was by a series of stakes set at five-foot intervals along two adjacent sides of the excavation. From these the horizontal position with reference to the zero point on the base line could be obtained very easily and quickly. The depth in most cases had also to be estimated from the same stakes. In spite of these difficulties, no unusual discrepancies were apparent when the general nature of the finds was compared with the more

carefully studied conditions obtaining in the trench of the previous year. The workmen were very considerate; and when, as happened repeatedly, a half-dozen or more human skeletons were exposed at one time, they worked in other parts of the cut until the material could be removed.

The work was completed in two weeks, the material moved amounting to about 67,500 cubic feet. The number of artifacts obtained was two hundred and sixty-five, with an additional half-dozen remaining in the hands of the workmen. One hundred and twenty-six human skeletons were also uncovered, but of that total number about ten were lost.

Shaft.—With a fairly complete knowledge of conditions prevailing in the dry upper portion of the mound, there was the urgent need for some clue as to the culture below the water-line. Probings had shown the depth and general composition; but as to the fauna represented, or the artifacts and skeletal material, not a single fact was available. The possibility of reaching the bottom through a strong head of water at least eleven feet deep seemed a little doubtful, without a heavy outlay for extraordinary means. However, during a dry period in February, the attempt was made and accomplished in less than three days at a very small cost. Three men were employed, two of them being kept busy at the pump while the writer with the third man carried on the digging operations. Under the circumstances, the dirt could not be carefully looked over at the time of removal from the shaft, and was therefore laid out on the surface according to horizons and later thoroughly examined. The material taken out of the shaft amounted to 560 cubic feet. All of this came from below the high-tide level; but only 325 cubic feet of the total volume were brought from beneath the normal ground-water line, which is about two feet six inches lower than the level of the highest tide observed. The yield of artifacts was thirty-eight in number. Of human remains there were obtained scattered fragments of two individuals, found seven feet below the high-tide line, and two nearly complete skeletons close to the bottom (see pl. 49, fig. 1, and pl. 50, fig. 2, nos. 273 and 274). No animal bones were found in the lower eight feet of the shell deposit; in fact, only three or four fragments were obtained in the entire shaft.

The place chosen for the shaft closely adjoined the section wall of the trench near the center of the mound (see pl. 48). This position allowed a partial completion of the charted section in the same vertical plane (see pl. 49, fig. 1); and to get this addition as accurately as possible some risk was taken by digging the shaft without sinking any curb, caving being quite negligible except at the bottom.

INTERNAL STRUCTURE OF THE MOUND.

The internal structure of the Ellis mound, while not so extraordinary as that of the accumulation at Emeryville, is very peculiar. As shown on plate 49, figure 1, the upper six or eight feet of the deposit is comparatively coarse material, being made up chiefly of partly broken mussel shells together with an intermixture of broken and unbroken clam shells. A certain amount of disintegration is apparent near the surface of the layer; but apart from this the material, which is laid down in decidedly irregular planes, is of uneven texture. Beds of ashes, bunches of stones, now and then wavy layers or lenses and pockets of distinct kinds of broken or unbroken shells are common; but there are no well-defined strata of raw and calcined material such as marked the upper part of the Emeryville mound.[8] The line which marks the division between this loose superficial material and the substructure is very definite and, in the main, regular. Below it the material is of an almost uniformly fine and compact nature, and likewise of a nearly homogeneous composition.

The structure here, as at Emeryville, is not well defined, the bedding planes being readily distinguishable only at some few points, for instance near the bottom of the shaft, where they are horizontal. For a thorough appreciation of the difference between the two parts of the mound attention is called to plate 39.

There is no evident explanation of the difference between the upper and lower portions of the mound, unless indeed it be that a very great interval of time separates the two portions of the deposit or that a new mode of life was suddenly established on the mound. It has been suggested, partly on physiographic evi-

[8] Uhle, M., The Emeryville Shellmound, *Univ. Calif. Publ. Am. Arch. Ethn.*, Vol. 7, No. 1, 1907.

dence in the region, that the finely broken and compact substructure was once submerged; and that the upper, loose material is the deposit added since the reappearance at the surface of this older portion of the mound. While the vertical movement itself might not be impossible in a region so unstable, submergence would have tended to disperse the shells rather than to disintegrate them; and if for a time the mound had sunk to depths beyond disturbance, some evidence of silt deposition on its surface should be apparent. Of this, however, there is not a trace. One point of which the writer has not been able to make sure is the relation of this line of demarcation to the silt wedges previously mentioned as entering the submerged mound slope (pl. 49, fig. 2). Apparently there is no connection; but the supposition that there must be some relation is scarcely avoidable.

CONSTITUENTS OF THE MOUND COMPOSITION.

The question of the elements entering into the composition of the shell deposits in the San Francisco Bay region has already been considered by the writer at some length in an earlier paper.[9] As was there pointed out, the shells of certain species of clam and mussel are common to all the mounds; but in addition to these there are present a number of less common species which are often somewhat localized. Besides the shells, which as a rule constitute the bulk of the refuse, there are varying quantities of charcoal, ashes, stones, and pebbles; and these latter elements in certain localities practically replace the shells altogether.

Shells.—The mound at Ellis Landing is made up largely of clam and mussel shells, the former in an unbroken condition being very conspicuous in the upper part of the mound (pl. 49, fig. 1). Now and then a few oyster shells, or even small pockets of them, occur; but they are almost negligible in quantity. This is worthy of note, as in the shellmound on Point Isabel, little more than two miles away, there is an extensive layer of oyster shells over two feet thick. Given in descending order of frequency, the following is a list of shell species as identified with the help of Professor Merriam:

[9] *Op. cit.*, pp. 335-338.

Mussels, *Mytilus edulis* and *M. californianus*.
Clams, *Macoma nasuta*.
Oysters, *Ostrea lurida*.
Cockle, *Cardium corbis*.
Tapes staminea.
Cerithidea californica.
Purpura crispata and *P. canaliculata*.
Haliotis rufescens.
Acmaea patina.
Olivella biplicata.
Helix, sp.

Probably all but the last two kinds named in the above list were used for food. Whether they were eaten in a raw or prepared condition does not appear, but the common occurrence of bits of baked clay fitting the form of mussel shells in various horizons of the deposits suggests that the mussels at least may sometimes have been baked. A comparison of the above shell species with the list from the Emeryville mound published by Dr. Uhle exhibits identity throughout. Quantitatively considered, however, some variation is noticeable; there being, for instance, a greater abundance of oyster shells at Emeryville and a much larger number of the univalves, *Purpura* and *Cerithidea,* at Ellis Landing.

Special attention may also be directed to the noticeable variation of the preponderating shell species represented in the section wall of the Ellis mound (see pl. 49, fig. 1). The lower portion of this accumulation is composed almost exclusively of mussel shells, and it is only in the upper eight feet that the clam shells become at all plentiful. This fact seems to admit of one or two possible interpretations: either the local physiography of early shellmound times was very different from that of the present day or else the mound people possessed boats of some sort.[10]

[10] Don Jose de Cañizares, the able Spanish pilot who conducted the first thorough survey of San Francisco Bay in the year 1775, in the report to his superior, Lieutenant Ayala, describes some interesting native crafts of that day. The pilot makes note of two Indian rancherias, one situated near the head of the San Francisco Peninsula and another near the west end of Carquinez Strait. With the latter community, which he says consisted of about four hundred souls, he had repeated dealings, visiting them in all four times; and he writes: "This Indian village has some scows or canoes, made of tule, so well constructed and woven that they caused me great admiration. Four men get in them to go fishing, pushing with two-ended oars with such speed that I found they went faster than the launch." In the log of the *San Carlos,* which was anchored near Angel Island during the absence of Cañizares, Commander Ayala has himself entered the statement that fifteen Indians came on a raft and were taken on board. Translations by E. J. Molera of the documents in question, together with a photographic reproduction of the first map of San Fran-

As is well known, the mussel lives only on rock-bound shores and must therefore, in recent geological times, have been relatively scarce in San Francisco Bay. The nearest, in fact almost the only locality on the east side of the bay where the Ellis mound people could have obtained this apparent mainstay of their existence would have been along what is now the Potrero San Pablo and Brooks Island. If these were insulated from the beginning, as they were in late prehistoric times, boats would have been required to reach the habitat of the mussel. If the people had no boats, then it must be that they were able to reach the outcropping range dry-shod, the mussel being in that case confined to the western side, as at the present day. To the writer the latter alternative seems the more probable, though this should not be taken to exclude entirely the possibility that the mound people possessed from the earliest times some sort of sea-going craft. There is one important objection to the supposition that the mound people possessed no boats and were therefore unable to reach the west shore of the bay, where the mussel is extremely plentiful. As is shown on the map appearing as plate 36, the inhabitants of over thirty more or less contemporaneous mound-sites were dependent on a strip of coast, which, at the present time, does not exhibit an abundance of the molluscs in question. It is possible, of course, that the mussel was once more plentiful on the Potrero shore, and that the mounds were not all populated at one and the same time.

The precise reason for the scarcity of clam shells in the lower portions of the mound is no less obscure than the reason for abundance of mussels. It is probably also to be explained on the supposition that in early prehistoric days the San Pablo-Wildcat delta extended as dry land directly to the eastern base of the Potrero San Pablo, as well as to Brooks Island. There was consequently no mud beach in the vicinity of Ellis Landing where clams could thrive. But in relatively late shellmound

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cisco Bay, are to be found in a small volume entitled *The March of Portolá and The Dicovery of San Francisco Bay*, published by the California Promotion Committee, San Francisco, 1909.

There is also both hearsay and printed evidence that the Indians who lived at Sausalito subsequent to 1838 were in the habit of carrying the mails to and from San Francisco on rafts of their own construction.

times the subsidence of the region flooded the lower margin of the delta and insulated the Potrero San Pablo, producing a stretch of shallow and comparatively quiet water in which silt could deposit to make a suitable habitat for the clam. Whether this explanation was in fact the origin of the clam supply or not, the Ellis mound people appear suddenly to have come to depend very largely upon this mollusc; and that the insulation of the Potrero and the consequent greater difficulty of obtaining the mussel had something to do with their change of diet seems probable, allowing even that the people possessed boats.

Vertebrate Remains.—The easily obtainable mollusca, while clearly preponderant, were by no means the only animal food which the primitive people living on the Ellis mound were able to secure. In the upper levels of the mound a fair variety of vertebrates are represented, though in a very fragmentary condition. Among these are two ungulates, several sea and land carnivores, one or two cetaceans, a small number of bird species, and a very limited quantity of bones representing two or three species of fishes.

Without the necessary material for comparison, the faunal remains have not thus far been thoroughly studied; but the following is a tentative list of only partly identified species:

Deer, *Odocoileus*, sp.
Elk, *Cervus*, sp.
Antelope, *Antilocapra americana.*
Sea-otter, *Enhydra lutris.*
Racoon, *Procyon lotor.*
Badger, *Taxidea*, sp.
Skunk, *Mephitis occidentalis.*
Wildcat, *Lynx*, sp.
Coyote, *Canis*, sp.
Dog, *Canis familiaris* (probably modern).
Sea-lion, *Zalophus californianus.*
Seal, *Phoca*, sp.
Porpoise, *Phocaena communis.*
Whale, indet.
Skates, sting-rays.
Several fishes, indet.
Ducks.
Several birds, not determined.

In the main this list agrees with that of the fauna obtained by Dr. Uhle[11] at the Emeryville mound, and it may almost be taken for granted that such specific differences as appear to exist are purely accidental. There is, however, a decided difference in the occurrence of the osseous remains at the two places. For

[11] *Op. cit.*, p. 18.

while at Emeryville the species identical with those at Ellis Landing were found rather irregularly distributed, but quite abundant even at the bottom of the deposit, in the Ellis mound not a single animal bone was obtained in the lower eight or nine feet. As the test was made with a shaft measuring only six feet square, this may of course be accidental;[12] but it was generally noticeable in all parts of the mound, above sea-level, that the remains of vertebrates decreased from the surface down, most of them being confined to the loose superstructure.

Charcoal and Ashes.—With the great bulk of shell there is mixed a large amount of charcoal and ashes and possibly some earth. Clear, white or yellowish ashes occur sometimes in thin streaks, or it may be in lumps (pl. 49, fig. 1); but their presence, like that of charcoal, is detectable throughout the mound. Some careful tests of the material show that in the upper part of the mound the shell and pebbles make up about 80 per cent. of the total volume, while in the finer and more compact substructure the volume of shell and pebbles is reduced to only 60 per cent of the mass, the remainder being suspensible in water. It is difficult, however, to say how much of this suspensible material is ashes, and how much may be disintegrated shell and fine earth.

Rocks and Pebbles.—The supposition that some earth is mixed into the composition is based on the presence throughout the mass of a surprising lot of small pebbles. These actually make up no less than 0.4 per cent. of the total volume. Besides the small pebbles there is scattered through the deposit a large quantity of broken and unbroken stones. In size these stones vary from small fragments up to slabs and boulders of forty pounds weight. Their distribution is not at all uniform, the stones occurring often in groups or bunches numbering as many as two hundred specimens (pl. 49, fig. 1). In view of the fact that many of these groups were imbedded in ashes, it seems probable that they were used as fireplaces; although in certain instances this was apparently not their use. The most remarkable occurrence of the latter kind was found in the trench, where, some eight feet

[12] On the other hand it may be accident that so many animal bones were found at the bottom of the Emeryville mound in the Uhle excavation, as the portion of the mound excavated was probably not the original center of the refuse collection.

below the surface, there were discovered about eighty schist slabs built together into a nearly spherical solid mass measuring about 2½ feet in diameter (pl. 49, fig. 1, close to right-hand end). There is no apparent explanation of this structure unless it bore some relation to an infant burial found not far from it.

The rocks represented, with some few exceptions, are not native in the immediate locality. After several varieties of sandstone, the most common rock is a mica schist. With this there are the glaucophane and actinolite schists. There are green, blackish and red cherts, of which the last-mentioned kind crops out on Brooks Island and also near the northeastern extremity of the Potrero San Pablo. Basalts of several varieties are common, and a very porous andesite was used quite frequently for mortars. Rhyolite, diabase, quartz, and obsidian are also present in lesser quantities. A number of chalcedonic amygdules and nodules of various shapes were also found.

The actual localities where these various rocks could have been procured are not in every instance definitely known to the writer; but the nearest occurrence of obsidian is in the neighborhood of Clear Lake, about one hundred miles to the north. A number of rocks, usually of the native kinds, showed indications of barnacles, still firmly attached. Apparently these specimens were originally removed from a salt-water beach such as is not now found in the immediate vicinity.

HUMAN REMAINS.

The Ellis mound was used from the beginning for burial purposes. This fact is not in itself remarkable, even were it not known to have been a world-wide practice to bury in the refuse-heaps, because interment in any other place would have been comparatively difficult under primitive conditions. There are no sand beaches on the bay shore, and the soils of the region are tough, and in fact quite impenetrable during the dry season to any but the best modern implements. These facts should, of course, not be taken as the precise and only reasons for shell-mound interments, either here or in any other part of the world. It seems probable, however, that many such customs, even those having the strictest religious motives behind them, originated somehow in mere external necessity.

Number and Distribution.—One hundred and forty-six skeletons, more or less complete, were obtained during the excavation. To this figure should be added about fifteen remains which were lost during the work of 1907, several being uncovered and removed by relic hunters who frequented the mound on Sundays. Taking the sum, 160, as the approximate total of human remains obtained from all levels of the refuse-pile by handling a little more than 72,000 cubic feet of material, it would appear that the entire mound, estimated to have had a volume of 1,260,000 cubic feet, might contain about 3,000 skeletons. In the opinion of the writer this figure is probably much too low. For if the mound, as previously suggested, is anywhere from three to four thousand years old; and if in its later stages it could support about one hundred people at any given time, the pile should contain more nearly 10,000 skeletons; provided most of the individuals comprising the one hundred or more successive generations were interred on the spot. To say that the mound did not count one hundred inhabitants is merely to lengthen its age, unless the per capita amount of refuse is increased beyond what seems probable.[13] The apparent discrepancy in the figures given above may perhaps be accounted for in part by the following observations.

As will be observed on the section-wall (pl. 49, fig. 1), the distribution of the burials is far from uniform. Skeletons were indeed obtained at all levels of the deposit, from about two feet below the surface to within a few inches of the bottom, or about twenty-eight feet below the summit; but most of the material was found in the horizon lying between the loose superstructure and the water level. It may well have been an accident, of course, that only two complete remains were found in the shaft, below sea-level. This excavation if moved a foot or two to one side or another might have yielded entirely different results. But as it is, the number found in the shaft raised the average rather than lowered it. The horizon which really reduced the average (to one skeleton per 456 cubic feet) was the upper six to eight feet of the deposit. Why so few skeletons were found here is not clear. It is true that some burials may have been removed from

[13] The estimated average is 120 cubic feet per life of thirty-three years.

this level, as considerable surface digging has been done in recent years; but this work was not so systematic as to account wholly for the notable scarcity of skeletal material. Cremation may have been introduced in late times, but if so, it was not uniformly practiced; in fact indisputable evidence of its use, such as has been found in a shellmound on Carquinez Strait, is wanting.

Other evidence that may have some bearing on the case is found in the fact that most of the skeletons found represent either men and women of mature years or infants apparently not beyond the foetal stage. Excepting two or three finds, children and young people were not represented. The meaning of this is uncertain. It is conceivable that only the old and infirm lived permanently on this and similar mounds, while the young and active portion of the population risked life in the interior of the Coast region. It may perhaps also be accounted for in a measure by a very low death rate among adolescents.

Methods of Burial.—It is to be regretted that no good photographs are available to show the characteristic dispositions of the skeletal remains, there having been little time to spare for photographing under the conditions obtaining when the skeletons were uncovered. In all possible cases, however, the essential facts regarding the position and arrangement of the bones were noted and charted, and figure 1 of plate 50 is appended to show what the camera could not accomplish.

Three general methods of disposal obtained, and two of these it seems are somewhat localized horizontally. The prevailing method, found in all parts of the mound, was to place the body on one side with the legs drawn up (knees to the chest or heels to the buttocks) and the arms flexed, the head often resting on the folded hands. Along the east side of the excavation of 1907 many of the remains lay face down with arms and legs both folded well under the trunk. In the trench, at the north end of the mound, several skeletons lay stretched out full length, generally supine but sometimes prone. Cardinal directions, it will be seen, were not observed, and as for horizontal disposition, it varied also, the head being often either higher or lower than the trunk.

Group burials were not uncommon. Figure 1 on plate 50 shows how two or three individuals were sometimes placed together spoon-fashion. At one place, in the eastern part of the mound, fourteen individuals were found that appeared to belong to one group. They were all doubled up and laid face down in three tiers, within a space measuring less than six by ten feet on the horizontal and three feet in depth. The principal object here, as in nearly all the other burials, seems to have been to dispose of the remains in the smallest possible space. Perhaps the preparation of a grave was not considered an easy undertaking even in this loose material. That graves were actually dug, in preference to any other methods that might have been followed in placing the dead out of harm's way, is suggested by a number of observations.

As evidence of intrusive burials the even depth of the graves shown on the section-wall may be noted (see pl. 49, fig. 1). If it be assumed that most of these individuals were buried when the mound surface followed the line dividing the loose upper portion from the compact substructure, these graves were dug to an average depth of four feet, which is about as deep as the Indians of historic times ever went. Another indication that the mound people sometimes dug into the refuse deposit far enough to disturb the remains of the dead already buried is found in the frequent occurrence of isolated human bones, often but a section of the femur or some other relatively strong bone. Finally, at one place in the trench four skeletons (nos. 82, etc.) were found in the same horizon and so close together that they were at first looked upon as a group burial. Upon closer examination, however, it was found that the right femur of the lowest individual was inverted, and that several of his missing ribs were lying about three feet away under a mortar in which rested the head of the topmost skeleton. It seems probable that we have here, instead of a group burial, four different interments almost in the same spot.

While there is thus little evidence of care either in the selection or the preparation of the grave, with the body itself it was often otherwise. With the infants were usually found a handful or so of small disk beads made from the Olivella shell, or else

some larger perforated disks or pendants of abalone shell (pl. 45, figs. 5, 6, 7, and 8). In the case of women, mortars, pestles, and awls were not unusual accompaniments. With the men, pipes, charmstones, obsidian blades and smaller weapons were frequently found. Sometimes the male skeletons were also covered with a heavy layer of red ochre or paint, a phenomenon which held true even to the lowest skeleton uncovered (see pl. 50, fig. 2, no. 274).

Nature of the Remains.—The skeletal material as brought to the University Museum forms a large collection. The finds range from a few fragments to complete skeletons, which are usually more or less broken. About a dozen skulls were preserved entire, and perhaps as many more can easily be repaired. On the whole, compared with burials in ordinary earth, the state of preservation of these remains is quite remarkable. The age of the different burials, as judged by depth in the deposit, is no criterion as to stage of preservation, the bones obtained from the bottom of the mound being in better condition than many of those found near the top. In some instances, near the waterline, the bones were heavily incrusted. The only skeleton found in perfect condition was obtained about two feet below the surface (pl. 50, fig. 1, no. 205, and pls. 40-41, fig. 1). Of this specimen only one bone was partly decomposed, the remainder being clean and white and hard.

Circumstances have not as yet permitted a careful examination of all this material, and it is not possible to state whether the physical characters of these people are certainly distinct from those of the recent inhabitants of this region. In the two skulls shown on plates 40 and 41 the types found in this mound are illustrated. The skull with the more pronounced superciliary ridges (pls. 40-41, fig. 2) was taken from a point slightly below high tide, and the other (pls. 40-41, fig.1) came from about two feet below the mound surface.

The teeth in many of the crania are ground down below the line of the enamel, and the jaws themselves quite generally show marked effects of suppuration. The anomaly of a tooth grown well up into the nasal cavity may also be mentioned. There was noticed also a series of fused cervical vertebrae, and an elbow

joint anchylosed in a flexed position. Other unnatural developments or diseased conditions of the bone were found, but on the whole the collection presents no very extraordinary features, either natural or diseased.

MATERIAL CULTURE.

As indicative of the life and culture of the prehistoric mound-dwellers at Ellis Landing there were obtained of implements, weapons and ornaments a total of about 630 specimens. Of this number, however, only 380 are accompanied with data of any kind, the remainder having been picked up on the beach or procured from Mr. Ellis, who obtained them from time to time either on the beach or in the old excavation. Many of these artifacts, although of course made of such relatively non-perishable materials as bone and stone and shell, are mere fragments; but as the range of types is comparatively limited, several complete representatives are available of all but two or three.

In attempting to give some account of these specimens it is deemed unnecessary to enter here upon any elaborate or detailed description, inasmuch as Dr. Uhle has so lately discussed the culture of a shellmound in the near vicinity. The various well-recognized types of implements are simply mentioned in groups and only the new forms receive specific attention.

Implements of Stone.

Mortars and Pestles.—Perhaps the most evenly distributed objects in the Ellis mound were mortars and pestles. They occurred, in a fragmentary condition, at all levels of the deposit; but a few complete or unbroken specimens were uncovered. In size the mortars range from a small, perfectly worked specimen that may be hidden in the hand (pl. 42, fig. 2) to an example like a small tub, eighteen inches in diameter. The weight runs from thirteen ounces to about one hundred pounds. The forms vary from semi-spherical to bucket-shaped; and the workmanship, though sometimes crude and careless, often shows deliberate attention to details. The material used is mostly basalt, though sandstone, and sometimes a very hard metamorphosed rock, are found in several cases.

The pestles vary in length from a hand's breadth to eighteen inches, and their weight runs as high as six and one-half pounds All grades of finish from the roughly pecked, or even natural adaptations, to smooth and highly polished specimens are to be seen. Two or three possess the constricted top figured by Moorehead and designated "phallic form," or Stockton type.[14]

One striking peculiarity in regard to the mortars and pestles is the broken condition in which they were usually found. For example, each of two of the strongest and heaviest mortars obtained (Mus. nos. 1-13240 and 1-11233) were broken into ten and thirteen pieces respectively. In the case of one of these it is difficult to imagine what force would have been exerted to break squarely in two a vessel of hard rock with sides and bottom almost six inches thick.

Another noticeable point about the mortars and pestles is their finished condition. This fact linked with another, namely, that the rock used is not native to the region, makes it reasonably certain that the implements in question were manufactured at a distance and in some way freighted to the mound.

Hammer Stones.—Closely related to the mortars and pestles is a series of oval and discoidal stones that were evidently used for striking. Some of them have either one or both of the mortar and pestle characteristics (pl. 42, fig. 3). That is to say, some have the shape of a short pestle with small depressions in one, two, or more of its sides; and others are cylindrical or discoidal, the end depressions being sometimes natural and adapted for holding the stone in striking with its edge, or the depression may be clearly artificial. A stone similar to the discoidal form is said to be used by the present-day Indians for cracking nuts and acorns. The various forms here recognized must have had several different uses, however. They exhibit no particular workmanship.

Rubbing or Whetstones.—It is difficult to apply any term other than "rubbing stone" to certain varying forms made of sandstone, all of which present one or more flat surfaces that have resulted from use. There are several of this kind in the collection, and one or two of them show marks of having been brought into shape by some pecking process (pl. 42, fig. 4).

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14 Moorehead, W. K., Prehistoric Implements (1900), p. 288, fig. 2.

Grooved Sinkers.—Another crude type of implement is the so-called grooved sinker. About fifty of these were obtained from the mound; and, until the shaft was dug, they were thought to be confined to the upper four or five feet of the deposit. As they are supposed to have been used for weighting fishing nets, this conclusion fitted well the fact that the few osseous remains of fishes were also found to be confined to the surface layer. But when the excavation was carried below the water-line the sinkers appeared again, and continued to the bottom, twelve specimens being found in the shaft alone. If, then, these grooved stones were used for fishing, the very earliest dwellers about the mound must have been peoples of no inferior ability.[15] What they did with the fish, unless they dried and cured them to take inland, is a mystery. Apparently very few were eaten on the mound site.

The so-called sinkers are more or less flat and oval objects, averaging half a pound in weight (pl. 42, fig. 1). The rough groove is in all cases transverse to the long axis of the stone,[16] but its continuity varies. If the stone is thin and flat, the groove usually encircles the whole mass; while if the stone is rough, say triangular in cross-section, there is no notching except on the corners. A practical man of to-day would make such sinkers in exactly the same way. One of these stones is rather broad and flat, and has its constriction so near one end that, were it not of brittle material, it would instantly be taken for a celt or axe.

Perforated Sinkers.—Another type of implement which perforce must be classed as a sinker is a crude, usually shapeless stone, provided with either a natural or an artificial perforation. Of this sort the collection exhibits fourteen specimens, all of which were bought from Mr. Ellis, who obtained them supposedly from the portion of the mound above the ground-water line. As no exact data bearing upon their occurrence is at hand and the forms are in no sense peculiar, the series is not fully illustrated

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[15] Cañizares, in the passage already quoted, states that the Indians living on Carquinez Strait in 1775 went fishing on their tule rafts and that they presented him with several species of fish, among them the salmon. See *The March of Portolá*, p. 66.

[16] Mus. no. 1-9142 is a possible exception. But the encircling element in this case is a sharp incision rather than a shallow groove. For an illustration, attention is called to Moorehead, *op. cit.*, p. 277, fig. 415—1: specimen also from Middle California. The collection contains in addition a spherical stone (diam. 1⅜ inches) that bears evidence of once having been provided with a sharply incised groove (Mus. no. 1-9143).

in this place. They are simply either angular or slightly waterworn pebbles of any chance shape, thin and flat (pl. 47, fig. 20), oblong, spherical or cylindrical. Two or three of the fourteen available bear some evidence of having been brought into cylindrical and plummet-like shapes by artificial means, but the amount of work done in all but one instance is very small. One of these dressed specimens (no. 1-10644), illustrated by figure 17, plate 47, and another example entirely in the rough (no. 1-10649) have each been provided on the body portion with a series of roughly parallel incisions that circle the objects transversely.[17] This particular feature seems to serve no useful purpose and may therefore be considered ornamental. On this basis the two specimens should perhaps be classed with either pendants or charmstones rather than with sinkers.

The ordinary perforated sinker is in no sense artistically wrought. Its purpose was almost certainly a practical one. The perforation, drilled in every case from opposite sides, is always near the edge or at one end and not, as in many ornamental pieces, near the middle. But the general type ranges in size and shape from the small pendants illustrated on plate 47 to the charmstones to be described in the following section.

Charmstones.—The great variety of forms generally designated charmstones were well represented at the Ellis mound. More than seventy were obtained, the specimens being found only in the upper levels of the deposit. In shape they range from nearly spherical to long, slender forms with more or less pointed ends. Plate 43 illustrates the most characteristic forms. That most of them were intended for suspension is indicated in some cases, as in figures 3 and 6, by asphalt still remaining on one end, this substance sometimes showing actual impressions of the fiber used. In other cases, illustrated by figures 5 and 7, there is a knob or a perforation at one end. In a so-called phallic form, named and partially illustrated by Moorehead,[18] both ends are

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[17] A similarly grooved specimen lacking the perforations was found in the mound at Emeryville (see Uhle, *op. cit.*, fig. 8, pl. 12); and others of like form have been obtained at Santa Barbara and the adjacent islands. For illustrations of the latter finds, see F. W. Putnam in the Wheeler Rep. on U. S. Geogr. Surveys west of the 100th Meridian (1879), Vol. 7, pp. 211 and 212, figs. 89, 90, and 91.

[18] *Op. cit.*, p. 281, fig. 421.

supplied with a knob as well as a perforation, as shown in figure 4.[19] The skill and taste displayed in most of these forms are admirable. It should be added that some of the specimens show excellently the triple process by which they were brought into shape. The stone was first worked down by rough chipping or scaling; after that it was pecked, and finally ground or polished. No particular kind of rock seems to have been preferred by the charmstone workers. Examples were found made of steatite, serpentine, sandstone, and rhyolite. In one instance the attempt had been made to dress and fashion a piece of actinolite.

Obsidian Blades, Spear-points, and Arrow-points.—Some excellent work was done by the shell mound people in chert and obsidian. The last-mentioned substance appeared to be absent from the eastern portion of the mound, but in the vicinity of the trench it was present in tolerably well-worked condition from the top of the mound to the bottom. Plate 44 illustrates all the various forms obtained.

The finest pieces found were some large double-pointed obsidian blades, the largest of which (figure 6 of plate 44) measured nine and one-half inches in length. Two such, with several charmstones and two pipes, were found with the painted skeletal remains of a large male (no. 149, indicated on plate 50). With the group burial in the trench were found several similar but smaller specimens more like those shown in figure 8. In this place there were also obtained several triangular pieces of obsidian (fig. 15) measuring, some of them, four and five inches in length. The facets on several of these appear to be ground smooth; and in the specimen figured, flaking has been begun along both sides of one of the angles, as if the intention of the maker was ultimately to fashion a spear-point. If this was not the real purpose of these, it is difficult to imagine that they could have been used for anything but drilling, and for such they seem too blunt. It is of course entirely possible that they had no specific use.[20]

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[19] Mus. no. 1-10641 has a knob at one end only; and the protruding portion of this element (which is precisely like the knob on fig. 4) has been ground away on two opposing sides.

[20] The Indians on the Hupa Reservation are known to have employed two such pieces of obsidian in removing the beard.

Scattered about at various levels in the mound were also found numerous smaller specimens of obsidian. In size and outline these vary considerably. The largest, like figures 3, 4, 5, 11, and 14 of plate 44, were presumably spear-points; while figures 1, 9, and 10 show slightly different forms of stemmed arrow-points. As may be observed on figures 7 and 9, these obsidian implements were sometimes finely serrated.

Besides working obsidian, the Ellis mound people sometimes tried other closely allied rock substances, such as flint, chert, and quartz. Some of these attempts are illustrated by figures 2, 11, 12, 13, and 14 of plate 44, which show clearly enough that they were not so easily worked as obsidian. The specimen numbered 14 is made from a chocolate-colored substance resembling a very hard slate.

Figures 1, 2, 3, and 4 on plate 44 were found at various but not absolutely certain depths below the ground-water level.

Cylindrical Stones, New Forms.—Figures 9 and 10 on plate 43 show examples of a number of small, smoothly-worked stones that were found in the Ellis mound. These objects are nearly equal in size, but they vary somewhat in form; some, like figure 9, being cylindrical, while others, like figure 10, have different diameters at opposite ends and resemble in general outline an ordinary cork. The squarely cut ends vary, in that some are true planes while others are slightly concave. Their use can scarcely be surmised.[21] It may be that they are simply sections of broken charmstones ground smooth at the ends.

Figure 9 is almost cylindrical with slightly rounded edges. It measures 7/8 of an inch in length and has a diameter of 1 3/8 inches.

Figure 10 is not absolutely symmetrical but it is about 15/16 of an inch long, with a diameter measuring on the average 7/8 and 15/16 of an inch respectively.

Pipes.—The most remarkable of the new forms found in the mound were probably the two or three steatite pipes shown on plate 45. Figure 3 was found with the group burial in the trench, and is a small cup-shaped specimen with a perforation

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[21] Two different suggestions have lately been made to the writer regarding the purpose of these specimens. One is that they were used as labrets, and the other that they were used as rests or anvils on which to crack nuts and acorns.

through the bottom. There is no evidence that it was used for smoking, other than its general resemblance to pipes in use by some of the modern Indians.

The bowl is $^{15}/_{16}$ of an inch high, and measures $1^{1}/_{16}$ inches in external diameter at the top. The rim is $^{1}/_{16}$ of an inch through and thickens gradually towards the bottom, which measures $^{3}/_{16}$ of an inch at the perforation. The perforation itself is $^{3}/_{16}$ of an inch in diameter, measured at the bottom, but it widens slightly toward the bowl. The bowl was worked out by a revolving drill or some other implement manipulated in a similar manner.[22]

The other two pipes, *i.e.*, figures 1 and 2 on plate 45, were taken with the painted skeleton mentioned above. These specimens are about three and one-half inches long. One of them, figure 2, is notable for its shiny, black polish, and strongly resembles a bottle neck, even to the extra band at the smaller end.[23] The other specimen presents the natural color of the smoothly ground stone, and is further distinguished by a thin flange or collar close to the smaller end. Both are thin-walled, and represent on the whole rather skilled workmanship. The method of perforation is a little uncertain, but the specimen shown by figure 2 seems to have been drilled from opposite ends by some revolving device; figure 1, while it may originally have passed through the same process, has since been enlarged by a lengthwise rasping stroke. From the condition of the smaller end of the bore it seems probable that figure 2 had a mouthpiece of bone or wood inserted, similar to the pipes found at Santa Barbara and on the islands off the coast of Southern California.[24]

Figure 1 is $3^{1}/_{8}$ inches long, about $^{7}/_{8}$ of an inch in external diameter at the larger end, and tapers to about $^{1}/_{2}$ of an inch at the smaller. The collar is situated $^{5}/_{8}$ of an inch from the smaller end, is $^{1}/_{16}$ of an inch thick at the edge and increases to $^{1}/_{8}$ of an inch next the body of the pipe. The extreme diameter of the collar is $^{7}/_{8}$ of an inch, the same as the greatest external diameter of the tube. The bore is $^{3}/_{8}$ of an inch at the smaller end and continues almost uniform for two inches forward and then gradually widens to $^{11}/_{16}$ of an inch.

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[22] Mus. no. 1-10684 is a specimen very similar in outline, but has a shallow bowl carved out in each end. The two bowls are connected by a perforation drilled through the center of the piece.

[23] Mus. no. 1-4552 is a specimen of the same general form recorded as obtained, about 1870, six feet below the surface near Vallejo.

[24] See Moorehead, *op. cit.*, pp. 239-240, and also F. W. Putnam in the Wheeler Reports upon the U. S. Geogr. Surveys west of the 100th Meridian, Vol. 7, pp. 125-134.

Figure 2 is 3⅝ inches long, has diameters respectively $15/16$ of an inch at the larger end and $11/16$ of an inch next the band; the band portion being itself ¾ of an inch. The bore at the smaller end is $7/16$ of an inch. It decreases in the course of one inch to a diameter of ¼ of an inch, and then gradually widens to about ¾ of an inch.

There remains to observe that while these pipes are perhaps unique as regards precise form, they are essentially of the type found in the mounds on the Pacific Coast from Puget Sound to Southern California.[25] The type in fact is still in use among the Coast Indians, as for example the Hupas of Northwestern California.[26]

Implements of Bone and Antler.

Awls and Needles.—Plate 46 illustrates various forms of bone implements found in the Ellis mound. The most common type was the awl, which occurred chiefly in the upper part of the mound, but samples of which were found down almost to the ground-water line. Normally these awls, as indicated by figures 4, 5, 9, and 10, are four or five inches long and are made from one of three specific limb bones of certain ungulates. The neatest and most ordinary form, still in use among present day Indians, is a somewhat flattened implement made from either end of the lateral half of a metapoidal (figs. 9 and 10). Sometimes a slightly different form is made by splitting the bone a second time, giving a small triangular cross-section (fig. 4). Occasionally the distal end of the tibia was used, but this bone does not split so regularly. The anconeal process of the ulna (fig. 5) was also quite frequently used, as it has been by shellmound people in many parts of the world. Many of the awls still retain a beautiful polish.

One noticeable peculiarity about many of the awls from the Ellis mound is a longitudinal groove worn on either or both of the flat sides. These grooves, partly shown by figures 5 and 10, are sometimes worked clear through the handle, thus producing

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[25] Harlan I. Smith, Shellheaps of the Lower Frazer River; *Mem. Am. Mus. Nat. Hist.* (1903), vol. 4, p. 181. By the same author, in the same series, see also vol. 2, Archaeology of the Thompson River Region (1900), p. 429.

[26] P. E. Goddard, Life and Culture of the Hupa; *Univ. Calif. Publ. Am. Arch. Ethn.* (1903), vol. 1, pp. 36-37.

in it a long, narrow slit. Whether this feature is due to use or was deliberately made for some special purpose does not appear.

Of finely pointed implements there were also found some slender needles or bodkins, with and without eyes,[27] measuring eight or nine inches in length (fig. 8). There are also in the collection some stouter implements with duller points, made sometimes from antlers, and sometimes from the penis bone of the sea-lion. No elkhorn wedges were found.

Bone Blades.—Some fragmentary implements of unknown use were found with the group burial in the trench (Burial no. 82, etc.). They are examples of thin bone blades, often a foot or more in length, that curve transversely like a shoehorn and are sometimes perforated at one end.[28] Only two broken and decayed specimens were obtained at the Ellis mound and these are very similar to the one figured by Dr. Uhle from the Emeryville mound.[29]

A remarkable specimen of this type is figured on plate 46, figure 7, a longitudinal curving blade with a rounded point. The specimen is 6 inches long, $\frac{5}{8}$ of an inch across at the broad square-cut end, and only $\frac{1}{16}$ of an inch thick. It is white and polished like ivory, although it was found in the sea wall about eight feet below the surface. But for its curve it might serve admirably as a paper knife.[30]

Notched Bones.—Figure 6 on plate 46 shows a sample of the peculiarly notched scapulae illustrated by both Dr. Uhle[31] and Professor Moorehead[32] as occurring in other parts of California. The specimens found do not, however, give any further clue to the real purpose of these implements.

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[27] The writer found no specimens provided with eyes, but Mr. Ellis has (or had) two or three examples of this kind, said to have been found in the old excavation. Their exact occurrence cannot be established beyond the certainty that they were found above the water line.

[28] A specimen was lately found in one of the shellmounds in Alameda that measured about 18 inches in length, 2 to $2\frac{1}{2}$ inches in breadth and somewhat less than $\frac{1}{8}$ of an inch in thickness.

[29] *Op. cit.*, pl. 8, fig. 5.

[30] Fig. 3, another specimen of a bone blade, was entered on the plate by mistake. It was found by the writer in the Emeryville mound, and is probably an arrow-point.

[31] *Op. cit.*, pl. 9, fig. 17.

[32] *Op. cit.*, p. 236, fig. 363.

Bone Whistles.—A unique find was that of a number of ornamented bone whistles, some of which are illustrated by figures 10 and 11 of plate 45. These occurred well down in the mound with the large group burial. On first being uncovered the writer saw one set, consisting of six or eight, lying side by side, as if they might have been a connected series like the Pan's pipe. The individual instruments are tubular bird bones of varying lengths and diameters. About midway they are provided with a circular vent opposite which, on the inside, is placed a lump of pitch or asphaltum sloping off in either direction. Some specimens are also more or less decorated on the outside with small disk beads set in asphaltum.

Fork-like Bone.—Among the new forms of bone implements there is shown by figure 1 of plate 46 a fork-like bone about four inches long. Part of the handle is missing. The specimen, found at a depth of twelve feet, bears a suggestive resemblance to some of the combs figured by Harlan Smith[33] from the shellmounds on the Lower Frazer River and to others figured by Nelson[34] from the Eskimo about Behring Strait. Professor Kroeber thinks it resembles a ceremonial implement sometimes used by the modern Indian girl on the occasion of her initiation into womanhood, when for some time she may not touch her head directly with her fingers.

Barbed Bone.—A second form not noticed before, at least in the shellmounds of the bay region, is illustrated by figure 2, plate 46. It is simply a piece of strong, split limb bone, pointed at one end and provided with a barb on one side. Excepting for a longitudinal curve it might readily be taken for a harpoon point of the common North Pacific coast type.

Shuttle-shaped Implement.—Perhaps the most interesting of the new forms of bone work found in the Ellis mound is illustrated by the accompanying text figure.[35] The object is difficult

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[33] *Op. cit.*, Vol. IV, p. 177.

[34] Nelson, E. W., The Eskimo about Behring Strait, *18th Ann. Rep. Bur. Ethnol.* (1896-7), p. 57.

[35] The Museum specimen, no. 1-11186, is much decayed and in a very imperfect condition. The illustration is made from a slightly different specimen recently found in one of the Alameda shellmounds, and by courtesy of the custodian, Mrs. M. H. Krautle, Librarian of the Alameda Public Library.

to describe in words; but in size and general outline it bears some resemblance to an ordinary sewing machine shuttle. Although made from exceedingly hard bone the carving has been done with great precision; every angle is sharp and definite, the curvature is even and the entire surface is smooth or semi-polished.

Fig. 2.

The specimen figured is 1⅞ inches long and the greatest diameter of the partly rounded end is ⅝ of an inch, exactly twice that of the stem portion remaining where a transverse groove has been cut into it from three of the sides. The object is asymmetrical, the side of it not affected by the transverse groove being straightened and flattened somewhat. The rounded portion comes to a definite though blunt point; and the angular portion, which is made of four plane surfaces (two that are parallel and two that approach each other), is cut off squarely; the end being itself a perfect square measuring ¼ of an inch across.

The use of such an object can scarcely be surmised. Its general nature as well as the workmanship it reveals is strongly suggestive of Alaska and Eskimo culture. The amount of work required to fashion it, and the care with which it has been done, seem to indicate that the specimen had some very definite function; and inasmuch as it does not appear to represent any animal and possesses no decoration of any kind, it may be assumed that its purpose was strictly utilitarian.

Indications of Pottery.

In two instances during the excavation clay was met with, once in a raw and once in a baked condition, that showed contrived form. Museum no. 1-13380 was a mass of burnt clay, found, partly shattered by the plow, at a level about three feet below the surface. Nothing suggestive can be made by trying to fit the remaining fragments. They are well-burnt although hardly of the proper sort of clay for good vessels. On one side some of the pieces present a distinctly smooth and curved surface, while the other side is marked by the lines of some vegetable fiber pressed against the clay in its raw condition. The other find is no. 1-13398, which was obtained about ten feet below the surface of the mound. It consists of some fragile bits of raw,

bluish clay mixed with finely broken shell and which, when exposed by the scraper, had the form of a bowl. This bowl as originally observed, with only the rim cut away, was about twelve inches in diameter and probably about four inches deep. The thickness of the bowl increased from the rim towards the bottom, the respective measurements being approximately one and one-half and three inches. At best such a bowl or dish could have served only as a stationary receptacle. It fell in pieces on removal.

Indications of Textile Work.

The direct evidence of any textile art practiced by these mound people is even more meager than the indications of their work in clay. At the same time it is difficult to imagine the purpose of the numerous awls and needles in the upper portion of the mound unless they were used in making baskets or in preparing clothing of some sort. The only direct evidence of the presence of textile work consists of some thin layers of charred or blackened organic material showing definite indications of pattern work. It must be stated, however, that these indications of possible fiber work occurred very near the surface.

Utensils Adapted from Shells.

Aside from their use in making ornaments, sea-shells seem to have been little used by the occupants of the Ellis mound. Strictly speaking, there is no evidence that these people ever made use of shells for anything but ornaments; at the same time, the repeated occurrence, with human remains, of large specimens of abalone shells points to their probable adaptation as receptacles. They might well serve the purpose of dishes although the line of apertures extending across the deeper part of the shell appears not to have been plugged up with asphaltum or any other non-perishable substance, as was the practice in Southern California. Aside from these grave-finds of abalones, a number of large, heavy *Tapes* shells were obtained, which it would seem might have been used for various household purposes.

AESTHETIC ATTAINMENTS.

In the foregoing descriptive review of the remaining evidences bearing on the material culture of the Ellis mound people, little reference has been made to their exhibition of artistic instinct. Ornaments, as such, are few; and what may technically be termed decoration is a rarity. Nevertheless, were even all direct evidence of taste lacking, it might still with justice be urged that these people showed a fine sense of form, particularly in the making of charmstones and of obsidian implements. Many of the former exhibit most pleasing curves and are as symmetrical as if they had been turned on a lathe; while the latter, usually symmetrical in outline, often have their varying and beautiful forms worked out in most delicate detail, far beyond utilitarian requirements. Mention has already been made of beads, pipes, and decorated musical devices, each of which surely suggests a people relatively advanced in the primitive culture stage.

One of the characteristic methods of decoration, employed quite extensively by the California Indians, especially in the southern part of the state, was to fasten the decorative elements by means of asphaltum. It is interesting to find that the same method was used for a long time by the prehistoric peoples of the bay region. This fact is perhaps best illustrated by some purely ornamental objects found by Dr. Uhle[36] at Emeryville, but the bone whistles (pl. 45, fig. 10) are fair samples of this work.

After all is said on the matter of artistic bent, it must be admitted that the attainments of these prehistoric peoples of the San Francisco Bay region fall far short of that recognized in the mound culture represented on the coast of Southern California and the adjacent islands. With the peoples of the San Francisco Bay region art and utility did advance hand in hand from the beginning, but the range of expression, especially in shell and stone, was comparatively limited.

Shell Ornaments.—Some of the ornaments used by these people were made from sea-shells. Plate 45 shows four of the forms obtained, and two additional forms may be seen in figures

[36] *Op. cit.*, pl. 9, figs. 8, 9, 10, and 11.

1 and 2 on plate 47. These six forms are however either common beads or simple pendants, there being no such quantity or variety of shell-work as in the Santa Barbara region or in the islands off Southern California.

Figure 5 (pl. 45) is a fragment of perforated abalone shell. This type of ornament occurs in both circular and quadrilateral forms, is provided with either one or two perforations near the center, and is sometimes ornamented with incised straight lines near the margin.

Figure 6 (pl. 45) shows some broken ends of perforated abalone shell pendants. These are sometimes two or three inches long and taper to a point opposite the perforated end. The margin is occasionally ornamented by criss-cross lines or as in the other type above mentioned.

Figure 7 (pl. 45) shows examples of small concavo-convex disk beads made apparently from Olivella shells. Not many of these characteristic California beads were obtained in the mound; and those found occurred with human remains.

Figure 8 (pl. 45) is the only sample of an entire Olivella shell found in the mound. It is perforated at the apex and strings readily.

Figure 1 (pl. 47) is a nearly circular pendant beautifully iridescent and probably of abalone shell, though it is unusually thin. The piece is concavo-convex, measures about 2½ inches in diameter and is provided with a perforation near the edge.

Figure 2 (pl. 47) is a fragment of a washer-like ornament made of abalone shell. It is a nearly flat disk 1½ inches in diameter with a perforation about ½ of an inch across. The outer margin, on one side, is marked at more or less regular intervals with short incised lines. This singular specimen was obtained from Mr. Ellis, who cannot vouch for its exact occurrence.

In addition to these illustrated specimens there was obtained a single example (no. 1-13024) of a small conical shell, *Acmea patina,* which may have had the apex artificially ground away. The perforation at any rate made it ready for suspension; and shells of this sort are said to have been used by late Indians of the California Coast as a "drop" for ear-rings.

Stone Ornaments.—From Mr. Ellis were also obtained quite a number of small or delicately worked stone implements that could hardly have had any other purposes than to serve as ornaments. All the different forms of this lot are illustrated on plates 45 and 47. Among them is a fragment of a circular disk or ring, a piece of perforated mica, and a whole series of pendants. The forms of these pendants, it will be observed, are circular, triangular, and oblong. Their lengths vary from three-fourths of an inch to two and one-half inches, and their weights

range from the merest fraction of an ounce to slightly over two ounces.

Figure 3 (pl. 47) is a form of ornament similar to the washer-like shell disk described above (fig. 1). Only a small arc of the piece is present; but it indicates a disk, about 3/16 of an inch thick, which had a diameter of 3 inches, and a large circular hole in the center measuring exactly 1 inch across. Near the outer edge there is a small perforation drilled from opposite sides. The specimen is made of mica-schist.

Figure 4 (pl. 47) is a piece of mica with a single small perforation through the center.

Figure 5 (pl. 47) is a circular stone about 1 inch in diameter, lenticular in cross-section, with a small perforation near the edge. The convex surfaces are ornamented by a number of straight, incised lines that, on one side, cross the center, forming true diameters. The specimen is made from a soft, slate-colored stone which readily takes a shiny, bluish-black polish.

Figure 6 (pl. 47) is a triangular pendant also polished a beautiful black. It measures less than one inch from the smallest angle to the opposing side, and is lenticular in cross-section. The perforation is near the apex of the smallest angle; and the opposite ends of this bore are connected by a slight incision or notch which runs over the apex-edge of the stone as if to keep the suspending thread in place.

Figure 4 (pl. 45) is the only specimen of this lot of stone ornaments found by the writer. It is a fragment of steatite that may have served as a lanceolate pendant. Being 1 inch wide and having a maximum thickness down the center of 3/16 of an inch, it is lenticular in cross-section. The perforation is drilled from opposite sides, and the portion of the stone between the perforation and the shallow notch crossing the end is polished almost black from wear of the string by which the ornament was suspended.

Figure 7 (pl. 47) is a comparatively long and slender pendant-like stone. It is roughly oval in cross-section and is provided at one end with a groove for suspension.

Figure 8 (pl. 47) is a fragment of a pendant of rather hard, slate-like rock. It is rectangular in cross-section.

Figures 9, 10, 11, 12, 13, 14, and 16 (pl. 47) are somewhat similar pendants made of a very soft greenish stone, probably a serpentine, that takes a slight polish. Some of them are sharp cones and others are roughly lozenge-shaped.

Figure 15 (pl. 47) is a peculiar boat-shaped specimen, which is not provided with a perforation.

Figure 19 (pl. 47) is a roughly bottle-shaped specimen, somewhat heavier than any heretofore described. It weighs about 1½ ounces.

Figure 18 (pl. 47) is the largest specimen grouped with this class. It is made from soft limestone, and is oblong in general outline, with a nearly oval cross-section. Some larger specimens of this form occur in the collection, and these it would be difficult to classify. They might have been either pendants or charmstones.

Figures 17 and 20 (pl. 47) are specimens already described in connection with perforated sinkers. Figure 17 might be classified as one of

three things: a pendant, a sinker, or a charmstone. Figure 20 is a roughly angular bit of stone, 1⅝ inches long and a half-ounce weight, provided with a perforation near the smaller end. The specimen had doubtless a useful rather than an ornamental purpose.

It must be stated that none of the forms figured on plate 47, excepting no. 1, were found by the writer. They were obtained from Mr. Ellis, who picked them up from time to time on the beach in front of the mound. Their occurrence can therefore not be accurately established beyond the certainty that they came from the portion of the mound above the ground-water line.

Bone Ornaments.—Bone seems not to have been used to any great extent for decorative purposes. Only a few sections of tubular bird bones were obtained, mostly from the loose upper portion of the mound. The larger of these specimens may have been intended for whistles similar to those illustrated on plate 45; but the shorter pieces were hardly intended for any such purpose. They might have been strung in some way and thus served as beads; though their scarcity and manner of occurrence do not suggest that usage. One specimen, plate 45, figure 9, is of interest because it is ornamented by two clean-cut spiral incisions running in opposite directions; and some of the diamond spaces produced by these spirals are further embellished by criss-cross work.[37]

SUMMARY AND CONCLUSIONS.

The Ellis Landing shellmound is situated on the northeast shore of San Francisco Bay, upon the submerged portion of a large fan or delta of geologically recent origin. It rests upon solid gravel, but is more than half buried in fine silt, which attains a depth about it ranging from eleven to sixteen feet. Above the surface of this silt, now covered with vegetation, the high tides rise at times more than two feet; so that it is fair to assume that the region has sunk at least eighteen feet since the ancient inhabitants began to accumulate the refuse deposit. The precise nature of the geological movement recorded by the mound is difficult of determination; but it seems to have comprised

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[37] For similar pieces from other parts of California see Moorehead, *op. cit.*, p. 272, fig. 411.

several separate stages, some of downward movement and possibly some of elevation.

The mound is one of the largest of over four hundred deposits of a similar nature that line the shores of San Francisco Bay. It measured originally 460 feet in length, 250 feet in width, and about 30 feet in height. The great volume, approximated at 1,260,000 cubic feet, is estimated to have been accumulating for a period extending over three to four thousand years.

The refuse composing the mound is made up largely of broken shells of the common clam and mussel, but some other species such as the oyster, the cockle, and the abalone are also sparingly represented. To these molluscan remains is added a considerable mixture of ashes, broken rock, pebbles, animal bones, human skeletons, artifacts, etc. The preponderating shell species change, quantitatively, from the bottom of the mound to the top; and there is also a sudden alteration in the structure and general nature of the deposit which indicates a possible gap in the history of the occupancy of the site. The animal bones, which are confined almost entirely to the upper half of the deposit, represent many species, and prove the mound-dwellers to have become in time very successful hunters.

The mound was used from its beginning as a burial place, and doubtless also as a residence site, there being several house-pits in good state of preservation upon it when first examined. The marshy or inundated territory surrounding the refuse heap made it for a long period difficult of access, and seemingly also unfit as a dwelling-place because neither fire-wood nor fresh water was near at hand. Nevertheless the mound has unquestionably been occupied subsequent to its partial submergence; and was no doubt the home of California aborigines at a time not long prior to the discovery and settlement of the country by Europeans.

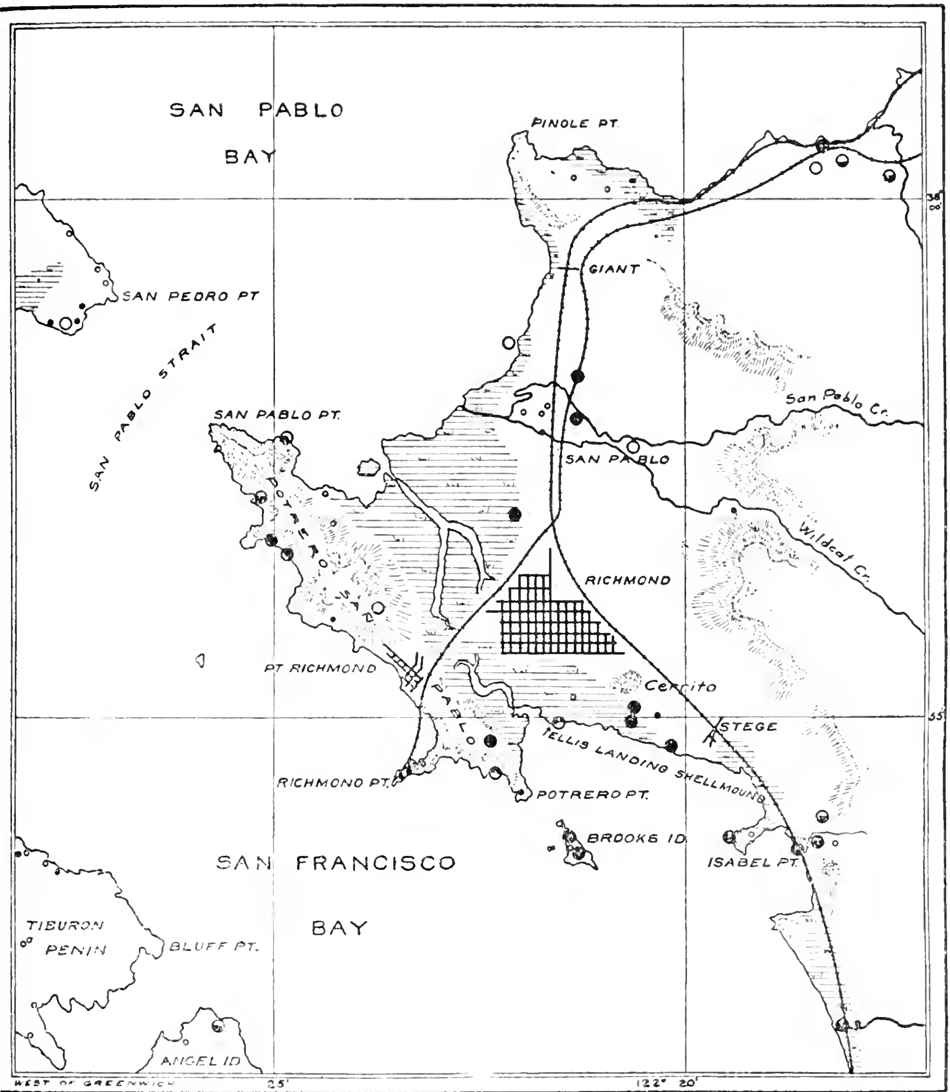
The material culture of the shellmound builders is represented only by a broken chain of evidence. Enough is present, however, to show that though the first people who camped on this site were by no means of the lowest known savage order, their knowledge and dexterity increased at an accelerating pace, as time went on, and this too, we may be sure, without any stimulating impulse from modern civilization. The first inhabitants, however ancient

they may have been, possessed some roughly made stone implements; they prepared vegetable foods; they knew the use of fire; and they painted and buried their dead. The last people to dwell on the mound had, besides a series of exceedingly well-made stone implements, quite a variety of bone tools as well as several forms of ornaments made of bone and shell. There is reason to believe that they tried to fashion vessels and other objects out of clay, and that they made baskets and dressed skins. They were skilled hunters on land and sea, and consequently must have had boats of some sort. The numerous kinds of stone used for implements in later times makes it reasonably certain that the mound people either made long journeys to the coast and also to various interior portions of the country, or had trade relations with those parts. Judging from the generally finished condition of the stone implements in question, it seems probable that these were manufactured at a distance and therefore perhaps not by the shellmound people themselves.

In concluding it may be well to point out that the same general types of implements prevail from the bottom of the refuse heap to the top. Certain notable additions were made in later times, and the progress towards perfection of manufacture is generally marked; but aside from these normal changes there are no important breaks in the culture represented. This means that if more than one people have lived on the mound, whether these were friendly migrants or disputing enemies, they were all essentially of the same type of culture, and the last occupants of the shellmound at Ellis Landing were probably Indians similar to those that have lived in Middle California within historic times.

EXPLANATION OF PLATE 36.

Map of the San Francisco Bay region in the vicinity of the Ellis Landing Shellmound, showing all the ancient refuse deposits known in this area.


SAN PABLO BAY
PINOLE PT
SAN PEDRO PT
SAN PABLO STRAIT
GIANT
SAN PABLO PT.
San Pablo Cr.
SAN PABLO
POTRERO SAN PABLO
Wildcat Cr.
RICHMOND
PT RICHMOND
Cerrito
STEGE
ELLIS LANDING SHELLMOUND
RICHMOND PT.
POTRERO PT.
BROOKS ID
ISABEL PT.
SAN FRANCISCO BAY
TIBURON PENIN
BLUFF PT.
ANGEL ID
WEST OF GREENWICH
25'
122° 20'
55'

EXPLANATION OF PLATE 37.

Fig. 1.—The Ellis Landing Shellmound at high tide, viewed from near the high land edge of the marsh. Brooks Island to the right. See text, pp. 360, 369.

Fig. 2.—The sea wall of the Ellis Landing Shellmound as it appeared in 1906, before excavation. View looking east. *Cf.* pl. 38, fig. 2.

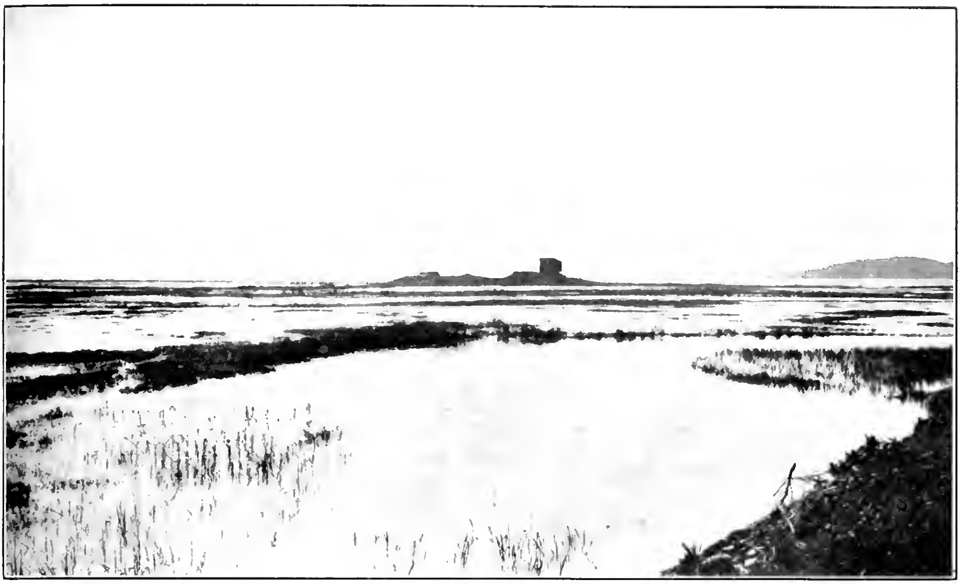


FIG. 1.

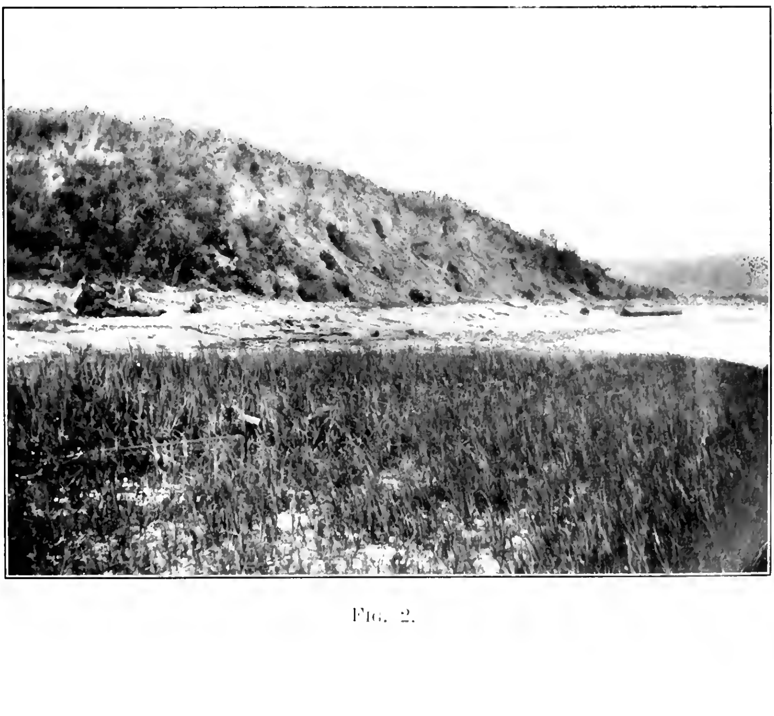


FIG. 2.

EXPLANATION OF PLATE 38.

Fig. 1.—Near view of the Ellis Landing Shellmound, looking seaward, taken after the highest central portion had been removed. Artificial canal in foreground.

Fig. 2.—The Ellis Landing Shellmound after excavation, showing also a portion of the recently made shell bar. View looking west. *Cf.* pl. 37, fig. 2. See text, p. 360.

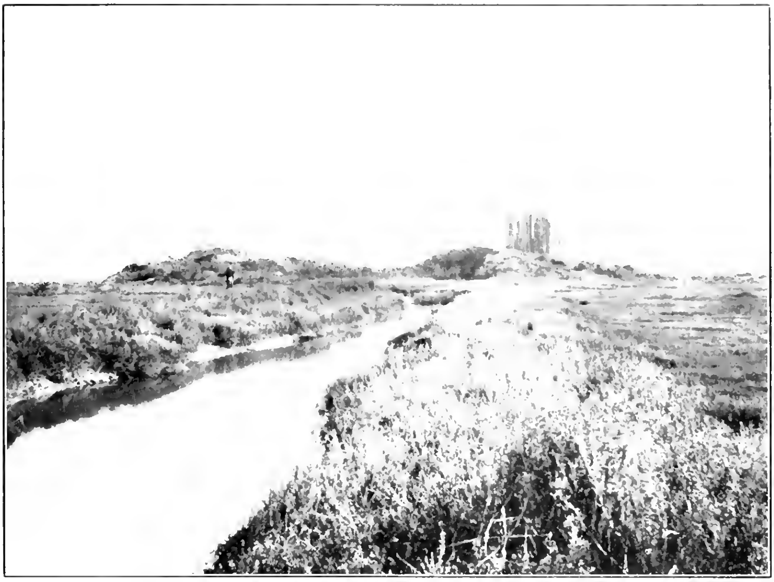


FIG. 1.

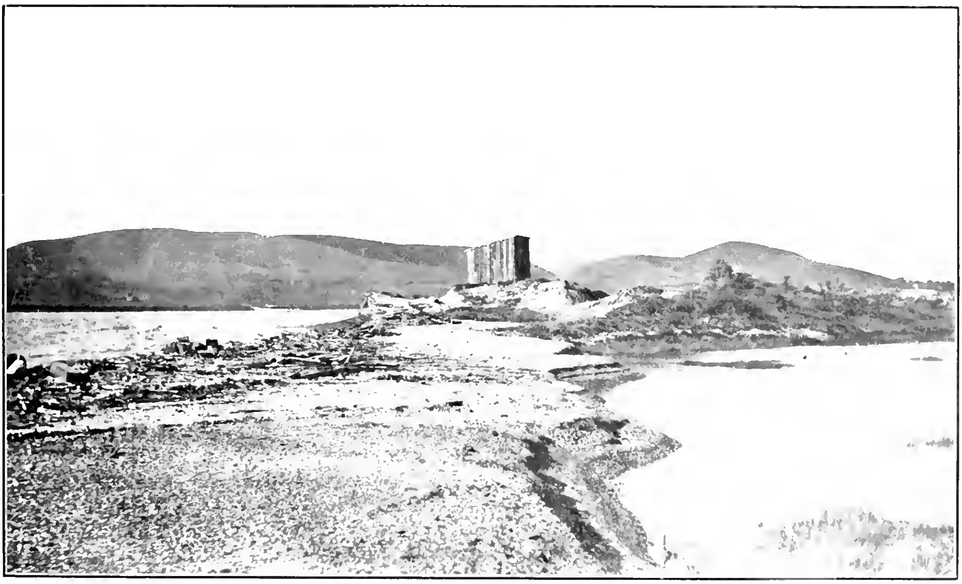


FIG. 2.

EXPLANATION OF PLATE 39.

View of a portion of the section wall of the trench, showing sudden transition in the nature of the mound composition. See pl. 49, fig. 1, for the place where the photograph was taken. See text, pp. 374-375.

EXPLANATION OF PLATE 40.

Fig. 1.—Male skull from the Ellis Landing Shellmound, found about two feet below the surface (see pl. 50, no. 205). For profile see pl. 41, fig. 1. Text, p. 384.

Measurements:

Length (glabello-occipital)	183 mm.	
Breadth (lateral maximum)	140	
Height (basion-bregma)	141	approximate
Gnathic—x (basion-alveon)	103	approximate
Gnathic—y (basion-nasion)	104	approximate
Diameter, frontal minimum	91	
Diameter, bizygom. maximum	138	approximate
Breadth of nose, maximum	28	
Height of nose	50	

Cephalic Index, 76.50

Gnathic Index $\left(\frac{x \times 100}{y}\right)$, 99.03

Nasal Index, 56

Fig. 2.—Male skull from the Ellis Landing Shellmound, found eleven feet below the surface and below the high tide line. (See group 230 on pl. 50.) For profile see pl. 41, fig. 2. Text, p. 384.

Measurements:

Length (glabello-occipital)	195 mm.	
Breadth (lateral maximum)	143	
Height (basion-bregma)	142	
Gnathic—x (basion-alveon)	91	approximate
Gnathic—y (basion-nasion)	100	
Diameter, frontal minimum	100	
Diameter, bizygom. maximum	147	
Breadth of nose, maximum	25	
Height of nose	52	

Cephalic Index, 73.34

Gnathic Index $\left(\frac{x \times 100}{y}\right)$, 91 approximate

Nasal Index, 48.07

Fig. 1.

Fig. 2.

EXPLANATION OF PLATE 41.

Fig. 1.—Profile view of skull shown in figure one of the preceding plate. From Ellis Landing Shellmound.

Fig. 2.—Profile view of skull shown in figure two of the preceding plate. From Ellis Landing Shellmound.

Fig. 1.

Fig. 2.

EXPLANATION OF PLATE 42.

Fig. 1.—Sample specimen of the numerous grooved sinkers (text, p. 387).

Fig. 2.—Miniature mortar (text, p. 385).

Fig. 3.—Portion of a hammer stone with a mortar-like depression in one side (text, p. 386).

Fig. 4.—Sample of a rubbing stone (text, p. 386).

All figures × ½.

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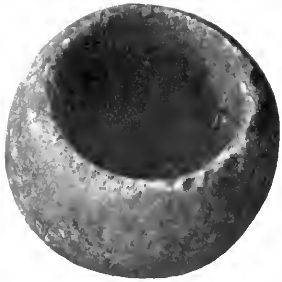

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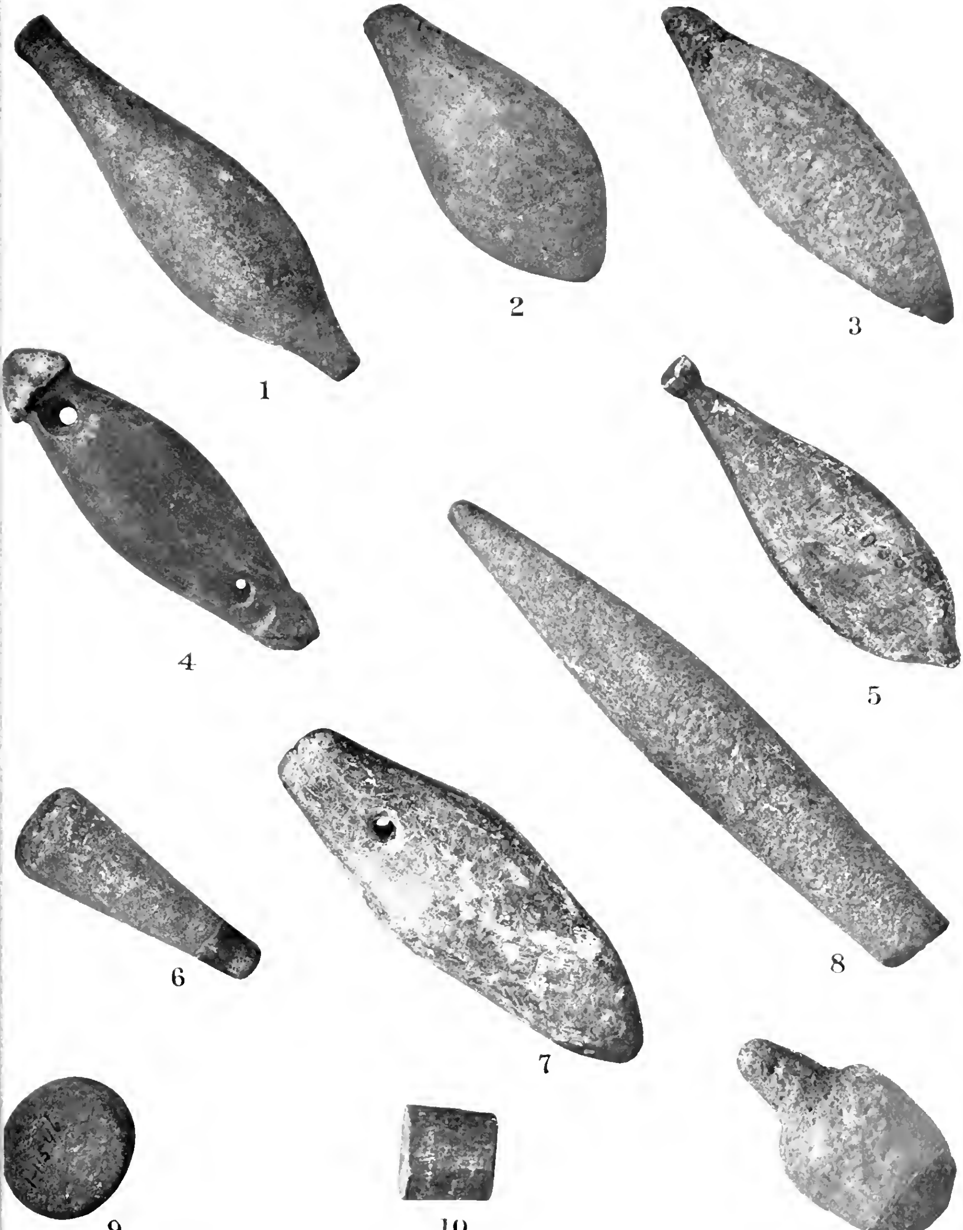
EXPLANATION OF PLATE 43.

Figs. 1-8, and 11.—Various forms of charmstones, with knobs or perforations for suspension. Figs. 3 and 6 have asphaltum on the tip ends. Figs. 2, 6, and 8 incomplete. Fig. 11 unfinished. See text, p. 388 *et seq.*

Figs. 9-10.—Cylindrical stones, possibly ear plugs. See text, p. 390.

Both figures about one-half natural size.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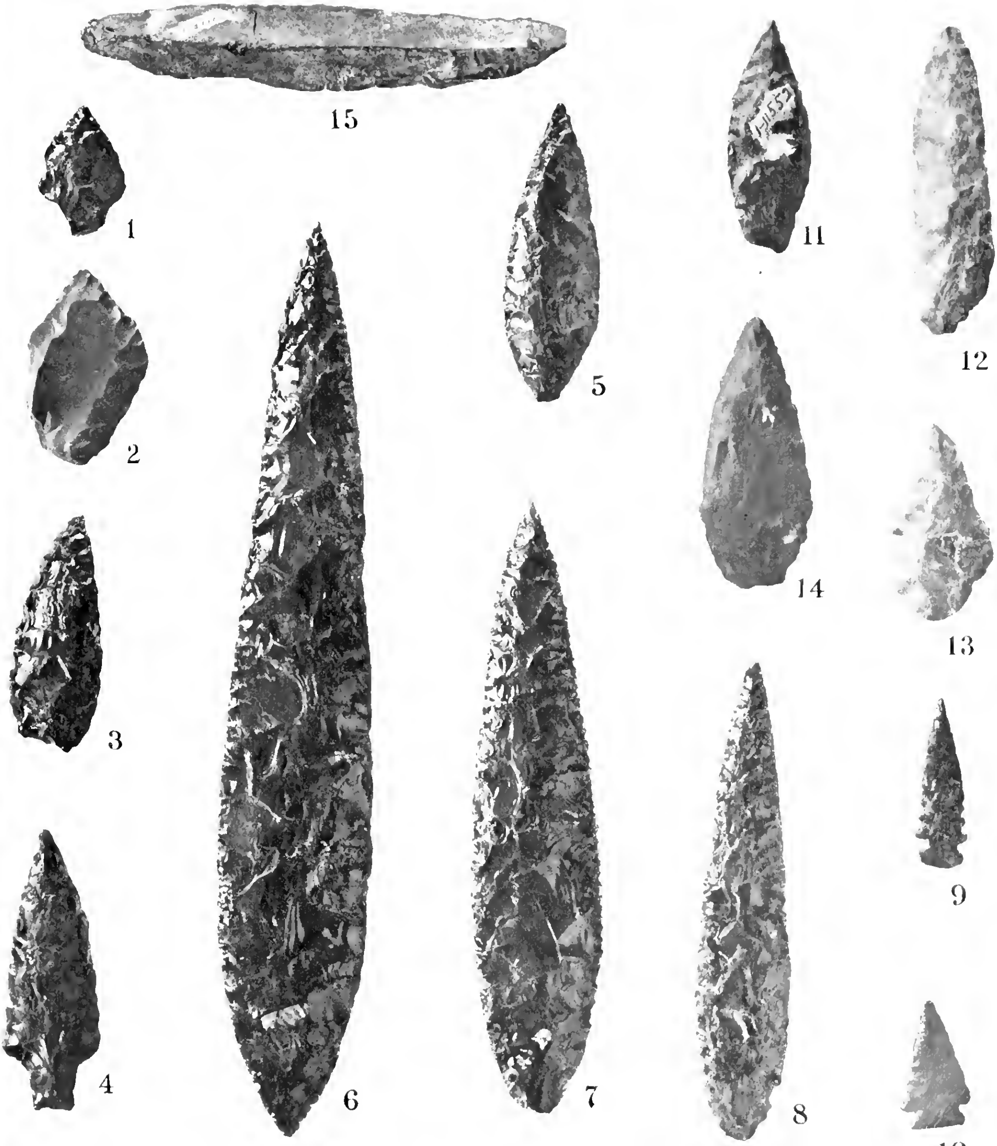
EXPLANATION OF PLATE 44.

Obsidian and chert implements of various forms and grades of finish. See text, p. 389 *et seq.*

All figures × ½.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EXPLANATION OF PLATE 45.

Figs. 1-3.—Pipes of steatite, fig. 2 highly polished (text, pp. 390-391).

Fig. 4.—Fragment of a perforated stone pendant (text, p. 398).

Figs. 5-6.—Pendants of abalone shell, fragmentary (text, p. 398).

Fig. 7.—Disk beads of Olivella shell (text, p. 398).

Fig. 8.—Perforated Olivella shell used as a bead (text, p. 398).

Fig. 9.—Tubular bird bone with incised criss-cross work (text, p. 44).

Figs. 10-11.—Portions of a musical instrument made of bird bones, fig. 10 ornamented with beads (text, pp. 394, 397).

All figures about two-thirds natural size.

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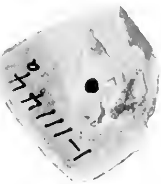

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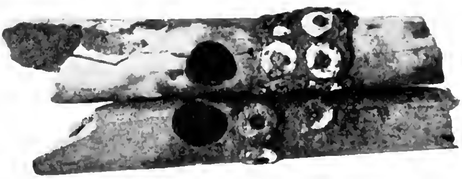

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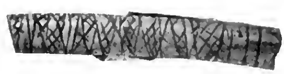

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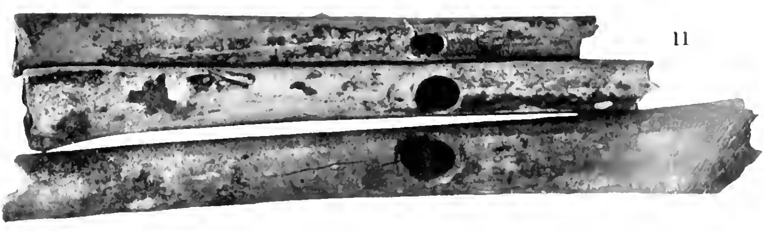


11

EXPLANATION OF PLATE 46.

Fig. 1.—Fork-like bone, incomplete (text, p. 394).

Fig. 2.—Barbed bone (text, p. 394).

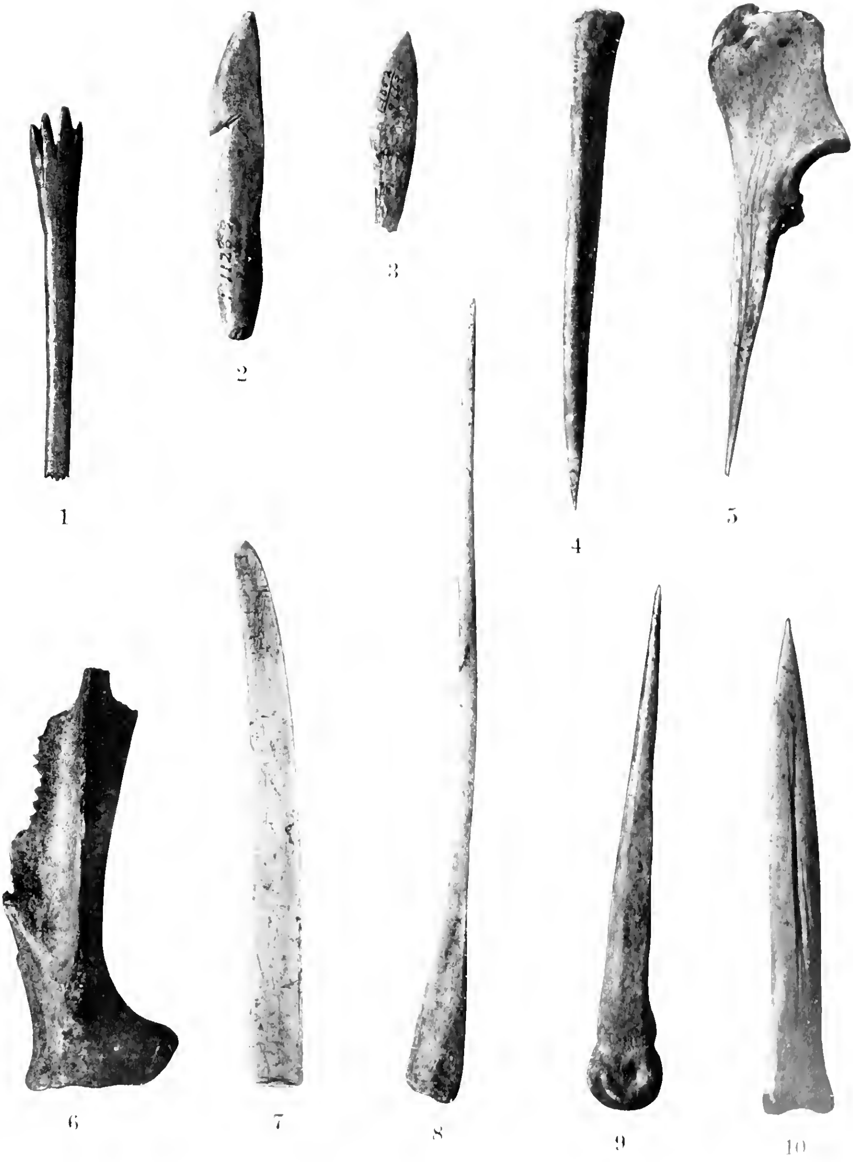
Fig. 3.—Bone arrow-point(?). See footnote 30.

Figs. 4, 5, 8-10.—Bone awls of varying form (text, p. 392).

Fig. 6.—Scapula with notched edge (text, p. 393).

Fig. 7.—Bone blade, thin and polished (text, p. 393).

All figures × ½.



1 2 3 4 5 6 7 8 9 10

EXPLANATION OF PLATE 47.

Fig. 1.—Pendant of abalone shell (text, p. 398).

Fig. 2.—Fragment of washer-like ornament of abalone shell (text, p. 398).

Fig. 3.—Fragment of washer-like ornament of stone (text, p. 399).

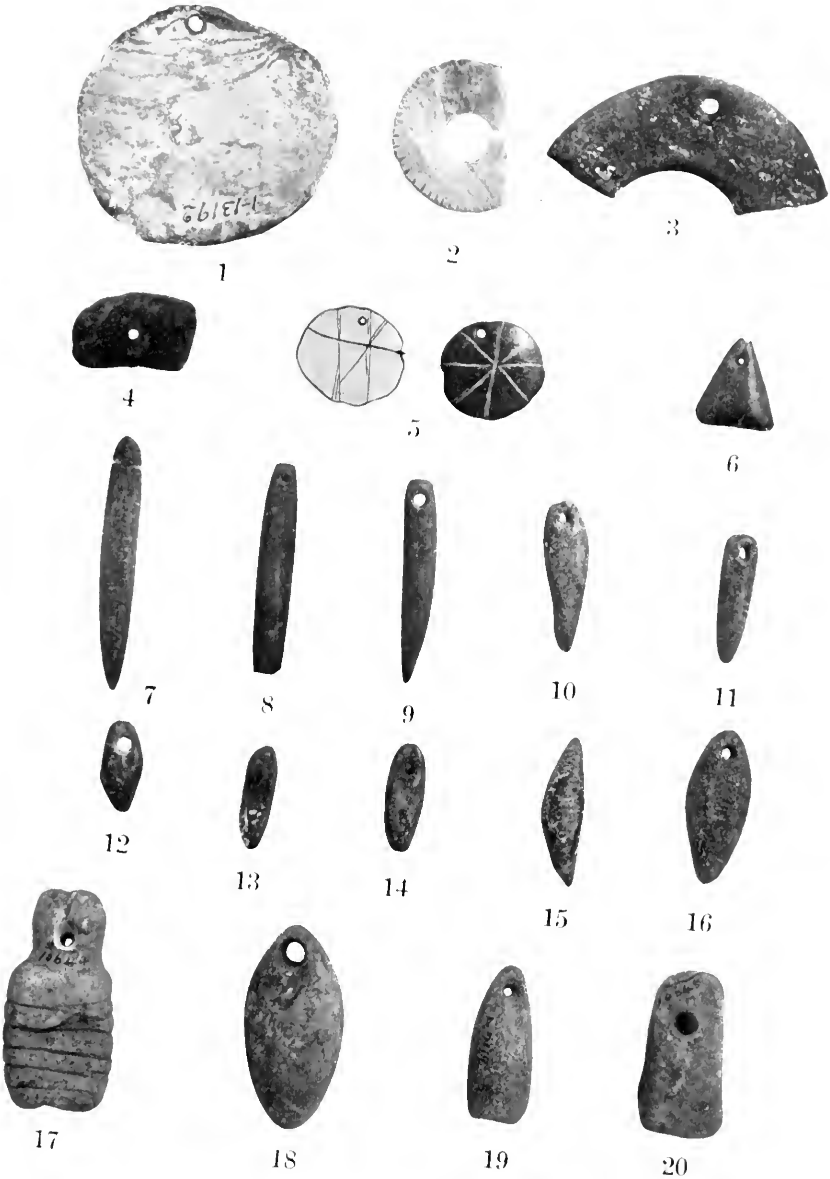
Fig. 4.—Perforated mica pendant (text, p. 399).

Fig. 5.—Circular stone pendant, obverse and reverse sides (text, p. 399).

Fig. 6.—Triangular stone pendant (text, p. 399).

Figs. 7-20.—Oblong pendants, mostly perforated (text, p. 399, also 388).

All figures about one-half natural size.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The explanation of plate 48 appears on the plan of the mound.
(See opposite sheet.)

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The explanation of plate 49 accompanies the sections of the mound.

(See opposite sheet.)

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The explanation of plate 50 accompanies the diagrams illustrating occurrence of human remains in the mound.

(See opposite sheet.)

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ERRATA.

Page 16, note 25.	For "Minook" read "Miwok."
Page 57, note 96.	For "Philadelphia" read "Pennsylvania."
Page 65, note 119.	For "Thuswap" read "Shuswap."
Page 150, line 13.	For "two-woof" read "two woof."
Page 161, line 21.	Change period to comma.
Page 184, line 23.	For "arrowhead-half, deer-back" read "arrowhead-half deer-back."
Page 185, line 9.	For "kū wī" read "kūwi."
Page 187, ls. 6, 24.	Insert comma between "arrowhead-projecting" and "xagá-datīp."
Page 188, line 8.	For "dalu" read "dalau."
Page 204, line 14.	Omit comma after "-maō."
Page 205, line 10.	For "oō′" read "ō′."
Page 206, line 7.	For "(or with)" read "and (or with)."
Page 207, line 22.	For "wina" read "mina."
Page 209, line 36.	For "xaga′datap" read "xaga′-datap."
Page 210, line 32.	For ' pcē′ meo" read "pcē′-meo."
Page 218, line 10.	For "thrown" read "shown."
Page 218, line 19.	For "dasē-sē-tenka" read "dasē sē tenka."
Page 218, line 20.	For "scattered along in a line" read "scattered-along-in-a-line."
Page 232, line 13.	For "daien′na" read "daie′nga."
Page 248, line 8.	For "*etot*-blank" read "*etot* blank."
Page 250, line 1.	For "pcē′-meō, *etot*" read "pcē′-meō *etot*."
Page 253, line 8.	For "arrow-split" read "arrowhead-split."
Page 261, line 9.	For "hua" read "hna."
Page 270.	"Gabil, long (E)" is omitted from glossary.

Errata.

Page 270. ''Gañk, man(E)'' is omitted from the glossary.

Page 280, line 5. Insert ''and'' after ''ones.''

Page 280, line 16. Omit ''shell.''

Page 282, line 4. For ''Horizontally'' read ''Diagonally.''

Page 282, line 9. For ''the middle band'' read ''all three bands.''

Page 284, line 8. For ''having a row of rectangles'' read ''and having a zigzag.''

Page 286, line 3. For ''rectangles'' read ''zigzag.''

Page 286, line 16. For ''vertically arranged'' read ''arranged in zigzag.''

Page 292, line 10. For ''border'' read ''bordered.''

Page 292, line 13. For '', and rhomboids diagonally arranged'' read ''bordered by smaller triangles and with three narrow lines between.''

Page 294, line 3. After ''by'' insert ''the dau which is filled with.''

Page 294, line 5. Omit ''winnowing.''

Page 294, line 8. For ''an interruption'' read ''the dau.''

Page 294, line 13. For ''an interruption'' read ''daus.''

Opposite page 296. Pl. 24, the wrong object is illustrated in fig. 4. A seed-beater in plain twining on radiating warp should have been shown.

Page 298, line 3. For ''storage'' read ''tobacco.''

Page 298, line 5. Before ''Lattice-twined'' insert ''Openwork.''

Page 298, line 6. For ''on a multiple foundation'' read ''plate-form basket.''

Page 304, line 4. For ''designs'' read ''elements.''

Page 306, line 3. After ''designs'' insert ''which are newly invented under American influence.''

Page 306, line 5. For ''An isolated design'' read ''One side of coiled basket showing one of its three equally spaced designs of unusual form.''

Page 308, line 2. After ''twined'' insert ''bundle warp.''

Page 308, line 3. To read: ''Figure 2.—Braided and twined warp border. No. 1-3040.''

Page 308, lines 4, 5. To read: ''Figure 3.—Simple turned-down warp border.''

Page 339, line 34. For ''*memphitis*'' read ''*mephitis*.''

Opposite page 416 and following, the objects illustrated are catalogued under the following numbers in the Museum of the Department of Anthropology of the University of California: Pl. 42, fig. 1, 1-13296, fig. 2, 1-13205, fig. 3, 1-13207, fig. 4, 1-11488. Pl. 43, figs. 1-11 respectively 1-13166, 1-11539, 1-11537, 1-10662, 1-13066, 1-11498, 1-13201, 1-11544, 1-11546, 1-13022, 1-13279. Pl. 44, figs. 1-8 respectively 1-13910, 1-13909, 1-13924, 1-13912, 1-13191, 1-13156, 1-13155, 1-11201, figs. 11-13 respectively 1-11552, 1-11506, 1-11522, fig. 15, 1-11189. Pl. 45, figs. 1-9 respectively 1-13164, 1-13163, 1-11188, 1-11502, 1-11144a, 1-11184, 1-11145, 1-11187, 1-13052, figs. 10-11, 1-13218. Pl. 46, figs. 1-10 respectively 1-11172, 1-11259, 1-9663, 1-13030, 1-11177, 1-13091, 1-11523, 1-13013, 1-13158, 1-13062. Pl. 47, figs. 1-20 respectively 1-13192, 1-10687, 1-9123, 1-10661, 1-9122, 1-10657, 1-10642, 1-i0656, 1-9116, 1-10652, 1-9117, 1-10653, 1-10658, 1-10655, 1-10643, 1-9118, 1-10644, 1-10651, 1-9119, 1-10648.

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